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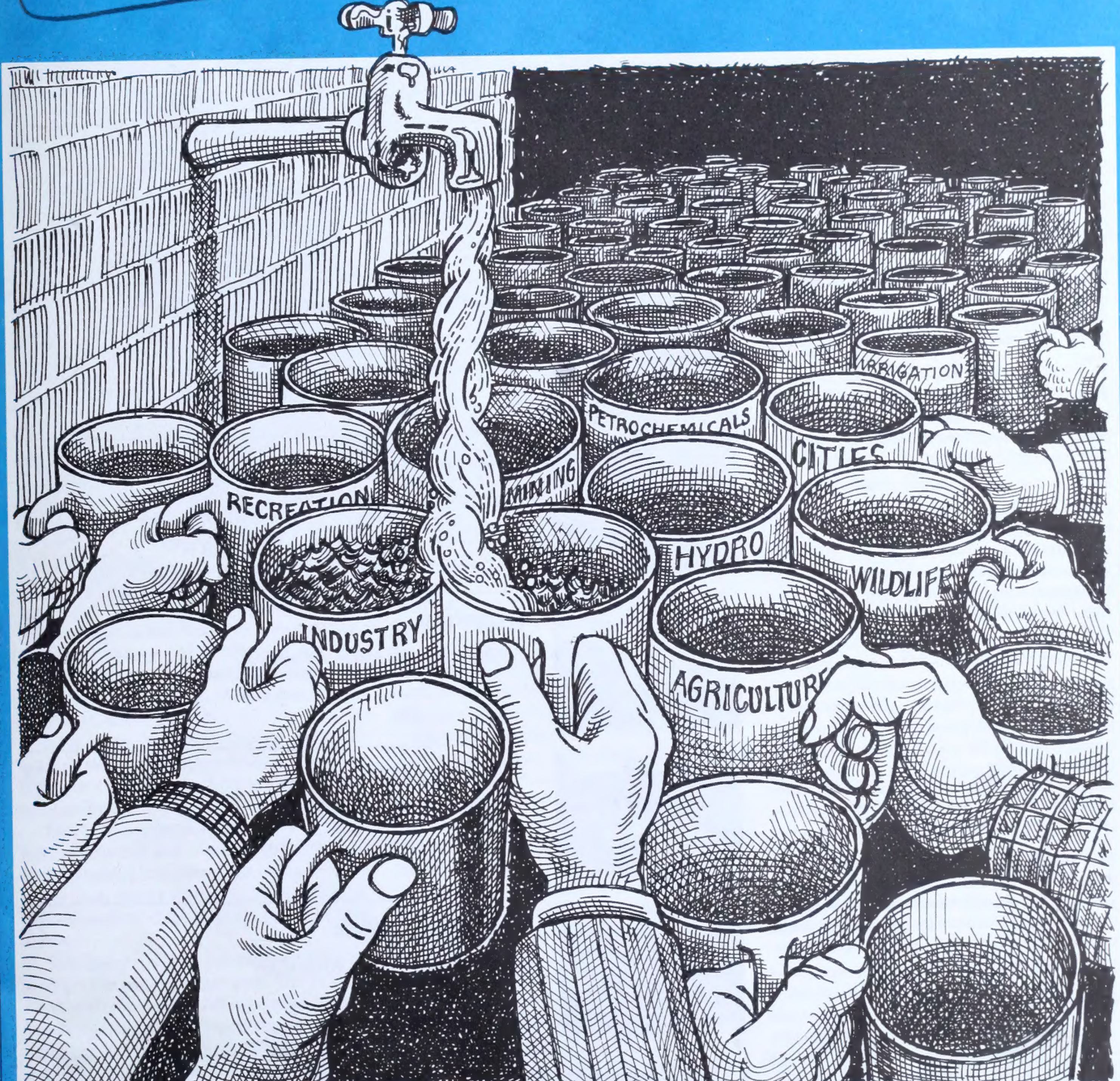

River Basin Planning

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Environment Views is published bi-monthly by Alberta Environment. Each issue deals with a specific topic from various viewpoints with the aim of increasing awareness of environmental issues among Albertans. *Environment Views* is directed by an independent board with representation from environmental groups, government and industry. The views expressed by the publication are not necessarily those of Alberta Environment.

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Letters to the editor are welcomed, and should be sent to the editor,
Environment Views
Alberta Environment,
Communications Branch
12th Floor, Oxbridge Place,
9820 - 106 Street,
Edmonton, Alberta T5K 2J6

Editor:
Maryhelen Vicars
Researcher:
Susan Bramm
Editorial Board:
Jacquie Champion, Carey Johannesson, Jerry Lack, Jim Martin, Dave McCoy, Ray Rasmussen, Stephen Tyler, and Bob Westbury.

The editorial board was helped in preparing this issue by Alberta Environment river basin planner Dick Hart, Frederick Ross, manager of the Lethbridge Northern Irrigation District and by Carl Primus, director of Alberta Environment's Planning Division.

Cover Illustration: Warren Clark

Alberta
ENVIRONMENT

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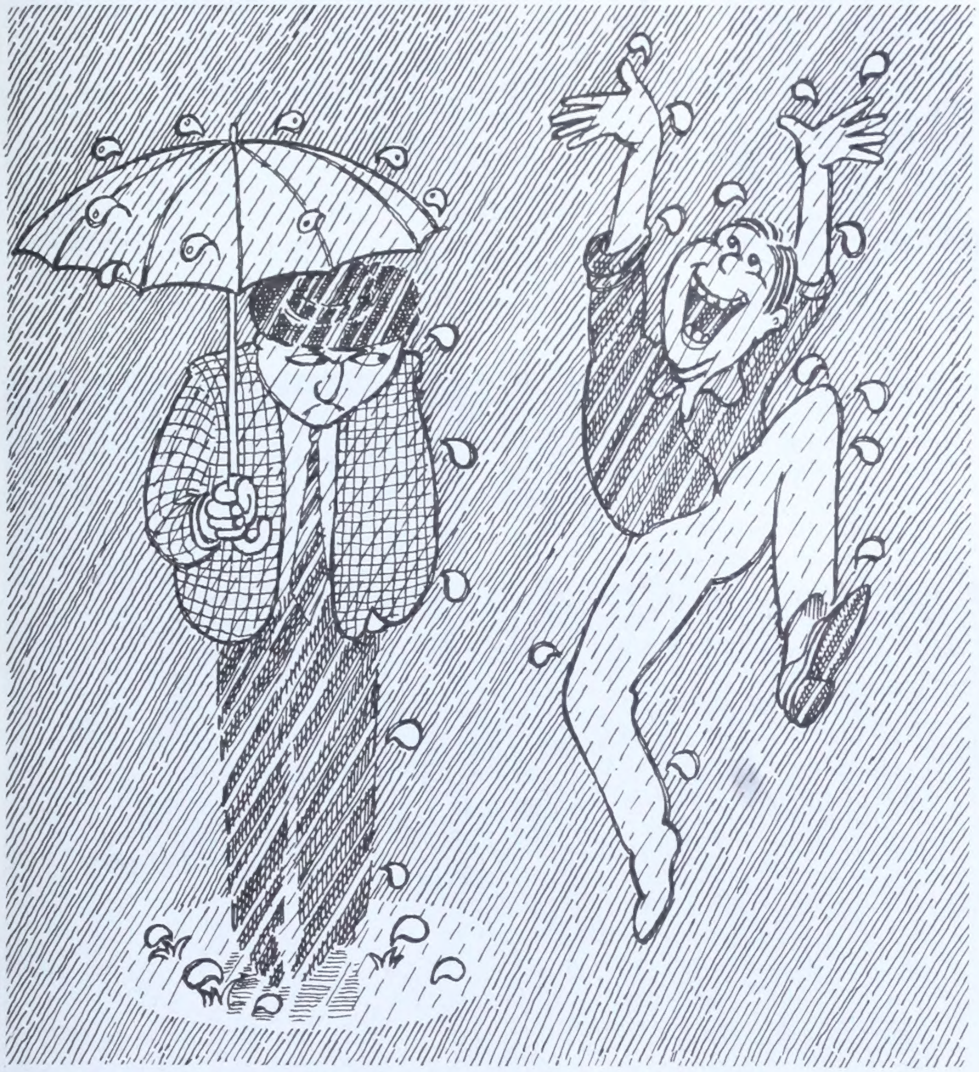
Editor's Notebook



WARREN CLARK

It's easy to drift into platitudes in a discussion of water resource management. Water is essential to life in a way few other resources are. Where it is scarce, its value is beyond rubies. Where it is superabundant, it is a plague.

In Alberta, we have fine examples of both situations. In the north, drainage is the big issue. In the south, there are many acres of near-desert.

Much of southern Alberta has wonderfully productive soil, a long growing season and abundant sunshine. But without more water than nature provides, its potential to grow abundant crops of grain and vegetable is lost.

In a hungry world, the obvious solution is to get the water to that land. But at what cost? Water management is a complex field, involving as it does resolving conflicting demands on the water itself and the land involved in river basins.

In this issue of *Environment Views,* we look at water resource planning, a tremendously interesting component of water management. An recent working paper prepared by the Inland Water Directorate of Environment Canada identified six river basins where scarcities have already appeared and where crises are expected in the future. Of these, three (the Milk, North Saskatchewan and South Saskatchewan) are in Alberta.

In this province, water management began 100 years ago, with the first irrigation projects in the south. At first, there were fairly simple solutions to straightforward problems: water was channelled onto dry fields, increasing yields. Elsewhere, ditches were built to protect land from flooding.

Today's problems are not as simple and the solutions, to be effective, must also be more complex, taking into consideration the different needs of different sectors of the province's population and economy. A sophisticated planning system attempts to resolve these conflicts and manage the resource for the greatest benefit to all.

Writer Sharon Adams interviewed planners in Alberta's six major river basins for a summary of the problems and solutions in different parts of the province. While there were many differences, some problems were shared: a concern with water quality and land use, for example. (see story page 12).

How do you calculate just how much money should be spent on water management, on such things as weirs, dams and canals for irrigation, for example? Planners have had to devise formulae to calculate the return which can be expected from such investments in terms of productivity (story page 23).

"Part of the problem in this whole debate is that we don't have a dollar value for a bucket of water," says agriculture economist Marvin Anderson.

If it is difficult to calculate the value of water for agricultural or industrial use, it is doubly difficult to place a value on it for recreation or esthetics. What is the intrinsic worth of preserving a river system, or a stretch of water, intact, for future generations?

In the next issue of *Environment Views,* we will be looking at the topic of environmental research; at the ways in which scientists are studying our changing environment.

As usual, we would like to hear from you. Write to us with your comments, your announcements for our Update page, or your ideas for future topics.

We welcome reaction to the themes or content of *Environment Views.* The following letter is in response to The Environment Movement of the Eighties: Part Two.

* * *

Dear Editor:

I strongly object to your inclusion of groups like Greenpeace, Sea Shepherd, and the Fund for Animal Welfare in the March/April issue.

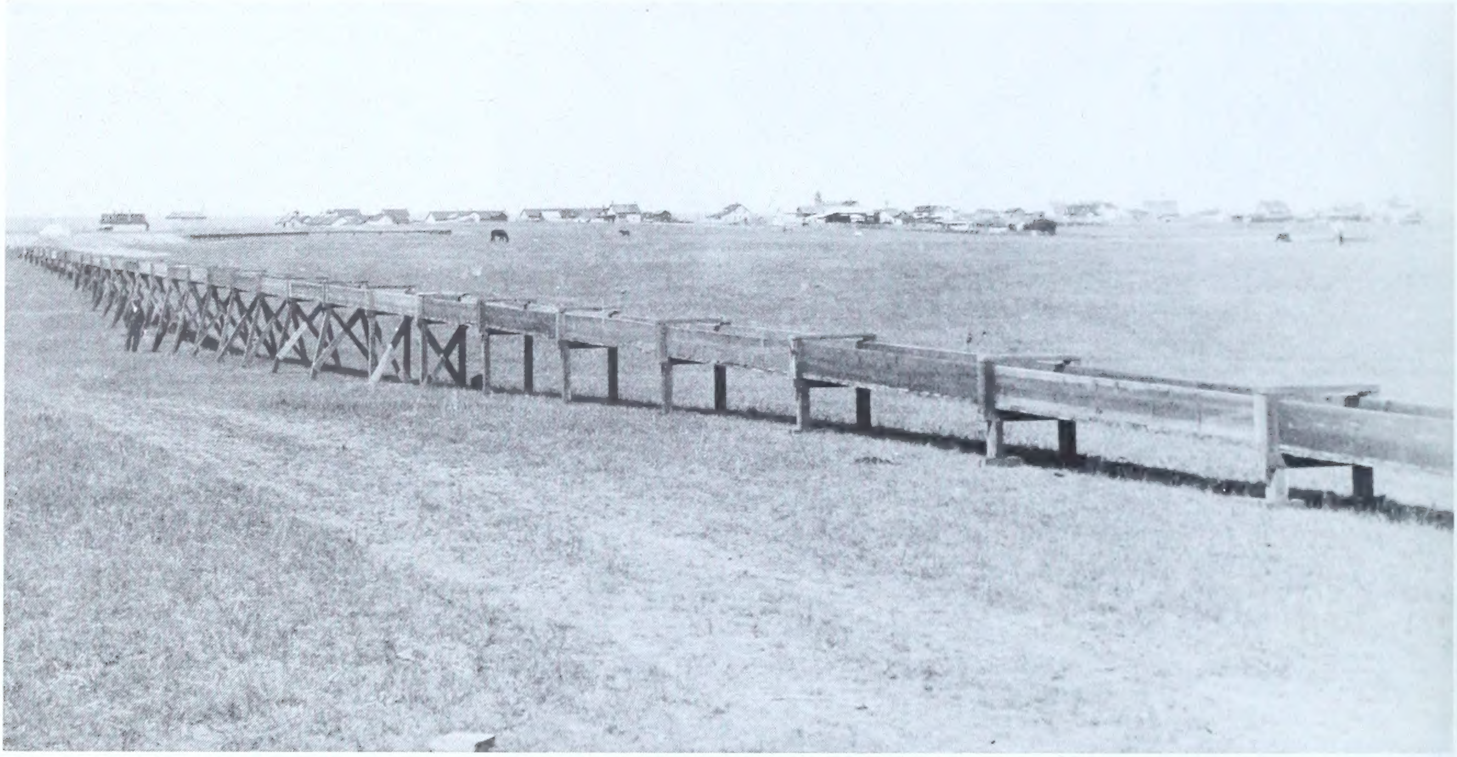
In terms of fostering institutional solutions to environmental problems (the major point in your last two issues), these groups have done for the Environmental Movement what the Hell's Angels have done for motorcycles.

Jim Powlesland
Graduate Student
Environmental Design
University of Calgary

Susan Bramm

Why Planning?

Water resource planning is an inexact science, but an essential one.



GLENBOW ARCHIVES

In the six millenia of recorded history, man has emerged as the master landscaper, altering the earth's surface to suit his purposes. Water has been a vital component in this evolution.

Water resources development in Alberta began as a result of the federal government's attempt to promote permanent settlement along the Canadian Pacific Railway. Settlers in the semi-arid plains were frustrated in their farming attempts by the shortage of water. Initially, all reports of "desert" conditions were ignored by the government. In the 1880s, William Pearce, then a senior official stationed in the west, advocated that water from the foothills be made available in order to keep people on the land. This proposal was considered unnecessary and unpopular, but it was accepted after the devastating drought of 1886-1896. The result was the Northwest Irrigation Act of 1894.

The Act declared all water resources in western Canada Crown property, thus granting the government the authority to administer water for the maximum benefit of the people. It recognized that water should be managed for its "best" use. And it stipulated that an inventory of the water resource and potential storage and canal locations be made, to form the basis for the licencing, inspection and control of water development. This was the beginning of water resources planning in Alberta; it established some ground rules for thinking ahead about water needs and how to meet them.

Today Alberta Environment is responsible for water management in Alberta (excluding federal lands) and for waters that flow beyond its borders. Planning is an integral part. It is the link between Alberta's policies (as stated in the department's "Water Resource Management Principles for Alberta") and their implementation in water management activities carried out by the water resources management services.

Water resource planners provide the information base for the provincial politicians who make the policy and implementation decisions. Gathering and preparing this input may be a complicated process because of all the sources and types of data and analysis needed, and the integration required.

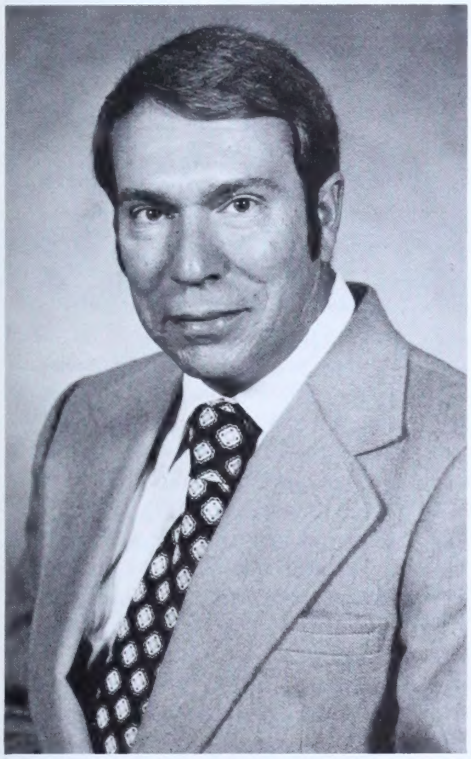
Water resource planners provide the information base for the provincial politicians who make the decisions.

Carl Primus, director of Alberta Environment's planning division, acknowledges that it is a major challenge to present a balance between "soft" (recreation, esthetics, wildlife) and "hard" (municipalities, agriculture and industry) water use demands. Different management alternatives and cost-effectiveness must also be considered. Much of this input is not generated within the

Wooden irrigation flume with the tiny community of Lethbridge in the background (left).

Recreation uses often take a back seat in planning, outdoor enthusiasts say (right).

BILL MCKEOWN



ALBERTA GOVERNMENT PHOTO

Carl Primus

division, but is contributed by the many participants in each study.

For example, there may be water use conflicts to be resolved. "Planning assists decision-makers in understanding what the conflicts are, the nature and depth of them, where those conflicts are irrevocable . . . or where there are opportunities for compromise or mitigation. Planning itself does not resolve the conflicts. It provides the framework and information base through which decisions can be made which do resolve the conflicts," says Primus.

In addition, the politicians will receive input outside the official planning route through public hearings, cabinet and caucus reviews and directly from interest groups.

Despite a trend toward a more comprehensive approach in water resources planning, some environmentalists still have reservations about the ability of planning division personnel to objectively present the data and possible solutions to the decision makers. Barry Sadler, an environmental consultant identifies the division as "a department set up for and by engineers with engineering solutions."

But Peter Melnychuk, assistant deputy minister of Alberta Environment in charge of water resource management services, defends the need for some "structural" solutions to Alberta's water problems (including such constructed works as dams and canals). He says that planners' preoccupation with water supply and control has in part been due to the way in which water moves through the province. To ignore the need to capture and control this water ". . . wouldn't make it possible to have it here for the use of Albertans," he says.

Some non-structural policies are now being adopted by the department. For example, there is massive funding for the rehabilitation of irrigation to minimize waste. "We don't have to build dams to rehabilitate canals and reduce seepage," says Melnychuk. Industry is now required to recycle at least 50 per cent of its total water requirement and the mining of groundwater has been severely restricted. More public education to develop a better consciousness about water use and conservation would have the best long-term payoff, he says.

Some elements of water resource planning in Alberta have been criticized. How future water use demands are determined and the costs of meeting these is one area. Dixon Thompson, of the University of Calgary's faculty of environmental design, says that because most significant water uses, including irrigation, are not metered, there is a poor information base for forecasters.

John Eisenhauer, vice president of the Alberta Wilderness Association, points to the problem of predicting the ultimate cost of large-scale developments. "Dam sites are not cheap. And costs tend to escalate . . . Look at the Red Deer — it was estimated to cost less than $50 million and it ended costing $147 million. What is the lost opportunity by placing and committing that money?"

BILL MCKEOWN

Peter Melnychuk

While planners have some methods of quantifying water needs for the "hard" water users, it is a more difficult task to identify and evaluate needs for wildlife and recreation. Alberta Environment's planning division has made some strides in addressing fisheries requirements by developing a computer model to test management strategies against habitat requirements for every fish species in Alberta. "If we are going to modify a system we can now decide how we can least disrupt the systems and be most beneficial to the fisheries," says Primus.

But the historic and natural values of our rivers have not received similar attention. "Our problem is that the Alberta government has yet to recognize the importance of our finest waterways," says Eisenhauer. "Nowhere in Alberta are recreation and natural history of paramount importance from a management perspective. There are certain rivers that should be looked at closely and

BILL MCKEOWN

Arleigh Laycock

set aside as recreational and natural rivers." These include the lower Milk River, which has a "landscape of Canadian significance"; the lower Bow between the Bearspaw reservoir and the Blackfoot reserve, considered a world class trout fishery; the upper Red Deer, "the finest accessible whitewater area in the province," and nine northern rivers.

"The major problems are not dams . . . but the destruction by insignificant increments." For example, the impact of siesmic and pipeline crossings and pollution from settlements can gradually degrade a river's esthetic qualities.

Bruce MacLock, Alberta Environment's senior northern river basin planner sees river preservation difficult to accommodate. "It forecloses water uses," he says. "As water managers we might want to allocate the water in a multi-purpose fashion. The water is flowing by continuously and there are a lot of competing uses for it."

Although the managment of Alberta's east-flowing rivers is governed by the Prairie Provinces Master Agreement on Apportionment allowing Alberta to utilize 50 per cent of the natural flow originating or flowing through the province, there is no equivalent water quality agreement in place. Nor is there any kind of agreement for the Mackenzie River Basin that includes the Athabasca, Peace and Slave rivers. In 1982 the intergovernmental Mackenzie River Basin Committee recommended that an agreement that addressed transboundary issues be established as soon as possible. Working groups have been set up but the route to agreement is expected to be a long one, says Primus.

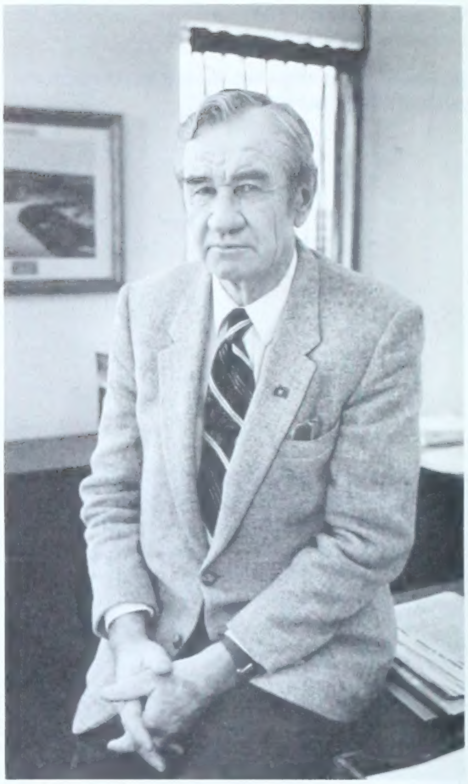
"There will need to be a more sophisticated agreement for the Mackenzie," says Frank Quinn, a staff member of a committee to examine federal water policy. "For example, timing of use will be very important. Part of the problem in the Mackenzie will be legal authority — what recourse do the NWT and federal governments have? Years ago it was assumed that every jurisdiction could do whatever it wanted."

What is the role of the public in water resources planning? Today there are several ways the public may contribute: as individuals, through ad hoc advisory committees or local interest groups; or through more formal hearings such as those sponsored by the Environment Council of Alberta (ECA) or the recently formed Alberta Water Resources Commission.

> ***"There are certain rivers that should be looked at closely and set aside as recreational and natural rivers."***

In studies of the Paddle, Red Deer and Oldman basins, public hearings were held by the ECA. Arleigh Laycock, professor of geography at the University of Alberta, feels that this form of public involvement was subordinated because in these cases the recommendations of the ECA panels (against the construction of dams) were not heeded by the government. Eisenhauer says "The formal public participation process deflects the concerns of the public away from the politicians and toward an advisory group."

Public hearings on the South Saskatchewan River Basin Study are expected to occur later this year. These will be held by a quasi-political advisory body, the Alberta Water Resources Commission, established by the Alberta Legislature in 1983. It has a five-year mandate to assess and review long-term water resources planning by the government of Alberta in relation to agricultural, economic, community and environmental factors in Alberta; to evaluate specific projects affecting water resources; to monitor intergovernmental negotiations affecting the water resources of Alberta and to make recommendations; and to advise cabinet on water resources legislation and policy.



BILL MCKEOWN

Henry Kroeger

The commission is chaired by Henry Kroeger, the MLA from Hanna. Other members include Bob Elliott, MLA from Grande Prairie (in northern Alberta), four senior government officals and three citizens. As a representative for the driest part of the province, Kroeger has long been aware of the importance of water as a resource. "Resources wherever they exist have always been used by people . . . water is a resource that can make things better, to keep you living."

He says that any discussion about water management leads into talking about economic development and food production. Which in turn leads to consideration of such global issues as the market conditions for whatever you are producing (whether it's electricity or tomatoes) and the need to produce more food for a growing world population.

Kroeger has seen how water is managed in other parts of the world, including Isreal and the Netherlands. He concludes: "Here we sit in Alberta with all this water and land and we're the greatest spectators in the world; we just watch it. (Effective) water management isn't standing there and watching it flow by."

He feels that the commission will be able to highlight the water management implications of decisions made by the cabinet committee on economic development to which it reports. To assist in this role, it is sponsoring five studies including a drainage inventory and evaluation, and a soils classification and irrigation study.

"There's no doubt that it is promotional for development . . . even though it has legal status and is presumably neutral", says Laycock. He feels that the commission will have to prove itself and is interested in the outcome of the South Saskatchewan River review, because he feels that policy could be heavily shaped by it. "I suspect the environment is going to take a back seat," he adds.

This reinforces what geographers Harold D. Foster and W.R. Derrick Sewell, have written in *Water: the Emerging Crisis in Canada.* "If energy self-sufficiency, increased agricultural production and the provision of high levels of water use for the factory and the home become the central focus of water management, the decline in Canadian environmental quality will be continuous rather than arrested."

A recent tabloid on prairie water management published by the Environmental Resource Centre in Edmonton proposes water management options to reduce or eliminate some of the negative environmental impacts. One strategy "may mean redesigning our development policies to reflect the water capacity of each region. This may also mean opting for a more modest rate of growth that reflects an increased value for environmental preservation." The writers call for the combined efforts of all levels of government and the public to identify regional and national goals and their consequences, effective strategies to achieve these and tough legislation to enforce management policies.

Water Resource Planning

The underlying goals and objectives for water management are presented in Alberta Environment's 1979 *Water Resource Management Principles for Alberta,* the set of guidelines covering general philosophy and specific management strategies.

This document begins with basic objectives and philosophy. "The water resources of Alberta are to be managed in support of the overall economic and social objectives of the province. The government's commitment to a program of balanced economic growth, the general welfare of Albertans, and the present and future quality of life are overriding considerations in water management. The supply of good quality water should not be a limiting factor in achieving these economic and social objectives.

"The philosophy of water management is based on:

- better use of available water resources;
- augmentation of available water supplies where necessary; and
- reduction of consumption."

According to these guidelines, planning must be in accord with the stated objectives and philosophy and conducted within a framework of land use planning.

Water use is a right obtained through a licence that outlines terms and conditions of use. The licence determines a prior right to the use of water in that location ie."first in time, first in right". When there are conflicts for the same water supply an order or preference exists: human consumption, food production, industrial use and other.

Water resources management is organized around the six major river basins in Alberta and is directed toward multipurpose use. The resolution of the water management problems of the South Saskatchewan River Basin is of highest priority. "The waters in each major basin must be fully and efficiently utilized before interbasin augmentation could be considered.

"Alberta will not be party to any undertaking for the possible export of water beyond Canadian borders."

The government encourages various water conservation strategies such as increasing water conserving technology in irrigation and reusing water. "The increasing cost of water management and the competing demands for a finite supply mean that water has an economic value and, in the long term cannot be treated as a free commodity . . . Broader user charges, designed to more fully recover capital costs and to establish the economic value of water, could be a potential management option toward promoting wise and efficient water use."

Other guidelines cover maintaining flows for in-stream uses such as fisheries, pollution prevention, irrigation, dam safety, environmental impact assessment and public participation, flood-plain management, project cost sharing and intergovenmental co-operation.

Frank Quinn, a staff member of the federal inquiry on water policy, notes that such policy guidelines are unique in Canada. "Most provinces haven't gone as far as Alberta in outlining principles. These are pretty well done and as specfic as Alberta can be . . ."

Others see problems with implementing them. "The problem with the policy principles (document) is that it doesn't have status in law. It was never a legal document," says Arleigh Laycock, professor of geography at the University of Alberta. He adds that some statements may not reflect current policy.

Dixon Thompson of the University of Calgary Faculty of Environmental Design urges that they be more fully applied ". . . the principles, if fully put into practice, would do much to improve water management in all jurisdictions," he said at a "water survival" meeting in Edmonton in 1983.

For example, although the principles recognize water pricing as a potential conservation tool, there has been little attention paid to it by water resource planners. Thompson says that water pricing for all uses, including waste disposal, would do more than encourage conservation: it would help convince the public that water is indeed a scarce and valuable resource, it would generate revenue and it would provide accurate information on how water is used. "Per unit pricing gives us the necessary information to do good planning." He is disappointed that the environment department planners have not included a "demand management" scenario using a unit pricing system as part of the South Saskatchewan River Basin program currently underway.

These policies are a product of the political process. "When we say that water resources planning and management is carried out 'in support of the broad social and economic goals of the province', we must to a large extent rely on society, through the political process, to define what those economic and social objectives are," says Carl Primus, director of Alberta Environment's planning division. As such, they will no doubt be modified in the future to reflect the changing goals and objectives of Alberta's citizens.

— *Susan Bramm*

Susan Bramm, an environmental biologist, is the freelance researcher for Environment Views as well as a member of the editorial board.

Ron Duffy

The Planning Process

The South Saskatchewan study is a massive undertaking

South Saskatchewan River near Medicine Hat.

ALBERTA GOVERNMENT PHOTO

"It was the best water management program ever seen in this province." High praise indeed for the South Saskatchewan River Basin Planning Program (SSRBPP) from Calgary environmental consultant John Eisenhauer.

Eisenhauer's praise is all the more remarkable in that it comes at a time when experts have tended to criticize the concept of river-basin planning. For example, J. O'Riordan, the director of Planning and Assessment in the British Columbian Ministry of the Environment, has argued that studies take a long time to complete and that they are often expensive relative to their usefulness. "In the past," O'Riordan has said, "They have produced extensive lists of recommendations, only a small proportion of which have been implemented."

The old comprehensive planning is giving way to the new strategic planning process. This involves a series of steps of which the first is to determine the present and possible future supply of water in a basin and the present and possible future demands on it.

Determining the supply and demand equation of water resources in a river basin involves time, effort and money, and too often in the past this input has lacked direction.

"The main concern," as O'Riordan told a national resource conference in Banff in 1982, "Is that many federal-provincial comprehensive river basin studies . . . emphasized the collection of new inventory data before resource issues and management objectives had been formulated."

Their studies, in other words, lacked focus. The tendency was to collect data first and ask questions about their utility in managing the resource later. Then towards the mid-1970s planners recognized that they could improve the focus of their research by first conducting a limited pre-planning study. Pre-planning studies helped to define in detail the water-management concerns and opportunities and the capability of existing data sources and analytic techniques to resolve them.

"We put a lot of work into the early phase of our program," says Jack Glenn of Alberta Environment, the man responsible for the SSRBPP. "You could call it the program design stage. We established the government's overall objectives for management. Then we examined more specific objectives: irrigation, industry, recreation and so on. Thirdly we looked at what we call the water-use objectives: the goals that the general public wants to see realized."

Once the pre-planning is done, the task of collecting the data goes ahead.

"Data collection was actually the least expensive part of our program," Glenn says. The overall cost of the SSRBPP he estimates to be about $500,000 a year. "A lot of the

SUSAN BRUN

John Eisenhauer

data already existed, and there was not much new work to be done. But we did spend a lot of money on developing ways to analyze and evaluate the data. We devised a computer program to handle the supply-and-demand balance. Our aim was to set in place a comprehensive methodology in relation to the objectives of the study."

"It took time to develop the models and make the accurate simulations," Glenn says. "The methodology we wanted is now in place and it has wide application, with modification, of course, to suit specific circumstances. The time involved was a good investment."

The second step in the strategic planning process deals with management options. This entails an evaluation of the various opportunities for managing water and related resources in order to balance supplies and demands both now and in the future, in accordance with management objectives.

"Ours was a two-stage program," Glenn explains with reference to this step in the process. "The emphasis here was on developing strategy. First of all we set up different scenarios as to how the water in the basin might be allocated and used. Then having done this, we wanted to know what kind of management processes could be set up to handle them."

"This second stage involves more detailed framework planning," Glenn says. "We have a good handle on current use of water in the basin. Now we are devising different scenarios for future demand and use based on what we know about the resources. For example, we set up different levels of irrigation development in different parts of the basin and looked into these and how they affected other uses of the water."

This management-options step in the planning process lengthens to a giant stride because it involves public participation. Public participation has gained growing acceptance in the planning and policy-making processes in water management. This is particularly so in those areas where major conflicts in water use are involved.

Public participation programs have been less successful in involving the inactive population, the so-called silent majority.

The public participation coordinator for the SSRBPP is Jim Marks. "In 1981 we began to approach the public. The gathering of the data had started and a thorough briefing of the public was necessary."

The first step was to make presentations to interested user groups: to farmers, local governments, MLAs, environmental and outdoor associations and so on. Altogether Marks has counted 180 groups with special interest in the South Saskatchewan river basin.

SUSAN BRUN

Jim Marks

But one criticism of public participation in the planning process is that it involves individuals and groups who represent specific interests in an adversarial position. Public participation programs have been less successful in involving the inactive population, the so-called silent majority.

The South Saskatchewan river basin, Marks points out, has a population of about a million. "We can't hope to reach everybody. But we're bringing out an interim report shortly. We intend to circulate this report as widely as possible. We'll use mailing lists, libraries, community centres, schools and so on. We'll advertise the availability of the report and that way we'll reach our core group of interested parties plus other members of the general public."

The Water Management Simulator

When John Eisenhauer describes the SSRBPP as being most advanced technically and in terms of public participation, he has in mind, among other things, the Water Resource Management Simulator.

The simulator is a computer programmed to produce situations similar to those we find or could find on the Bow, Red Deer or Oldman rivers. It models the supply and demand situation of a basin like the South Saskatchewan. The simulator's front panel illustrates two watersheds whose streams come together at the Saskatchewan border. Currently the upper stream is patterned after the Bow River, while the lower stream may represent either the Red Deer or the Oldman. Lights show varying amounts of snow pack, streamflow and water use. Levels of pollutants indicate water quality, and there are warning signals for flooding and fish problems. A digital display on the front panel shows apportionment as a percentage of natural flow during the months and years of a ten-year cycle.

MARTHA JONES

The simulator is being taken around the South Saskatchewan river basin area as part of the public participation program. In addition to its practical role in the planning process, it helps to raise public awareness of the issues involved. Presentations are given by planning program coordinators who had to be specially trained to use the simulator. "It's complicated and difficult to operate," Jack Glenn points out.

Those attending a presentation have an opportunity to try the simulator. Each is given a small control console connected to the computer and is put in a water management situation where he can try to find solutions to real problems. The participants make decisions and "implement" them by using the controls. The effects of these decisions — and those of others — are plotted on a graph on a color television monitor.

Some of the problems faced will be difficult. There are policies which have to be followed. Genuine snow pack and stream flow information is provided. Some years there will be adequate water; in others there will be too much or too little, but the region's water needs will always have to be met. These may include supplying cities and towns, industrial and energy requirements, and irrigation farming. Participants will have to prevent both floods and droughts, maintain proper wildlife and fish habitats, and meet the requirements of downstream users, including those in other provinces.

After each simulation the participants will have a chance to discuss the strong and weak points of their management strategy, modify it, press the reset button and try again. As they use the simulator, the coordinator will illustrate and explain various technologies, interpret the results of each simulation, and provide a link between the simulator and the "real world" of water management in the South Saskatchewan basin.

— Ron Duffy

In addition, Alberta Environment has produced leaflets and pamphlets for wide distribution throughout the area.

"It was high-profile public participation," Marks says, and John Eisenhauer agrees that in this respect, as in its technical innovations, the SSRBPP was "most advanced." But from this point Eisenhauer began to have reservations about the program.

"The extensive public participation plans were set to go," he says. "The leaflets and pamphlets were ready for distribution to the schools and so on. Then everything was frozen. The plan was being re-evaluated in Edmonton."

What happened at this time — November 1981 — was that provincial NDP leader Grant Notley filed with the speaker of the legislative assembly some 60 pages of secret — and highly controversial — documents outlining the government's consideration of a project to divert water from northern rivers to southern Alberta through a series of dams and channels. The rivers of northern Alberta account for 87 per cent of the annual flow leaving the province; those in the south for only 13 per cent.

"Because of the brouhaha in Edmonton," Marks explains, "we were told to hold back on our public participation program. We were told to go low-profile. The danger was that people would associate the South Saskatchewan program with this inter-basin transfer thing, whereas the two were not connected at all."

A year later, in November 1982, the president of the Progressive Conservative Association, Ron Nicholls, asserted that the Lougheed government was not now going to proceed with the plan to transfer water from northern to southern Alberta. Premier Lougheed told the legislature that the idea has been shelved because his cabinet had been divided on it.

Eisenhauer is unconvinced. "A great amount of circumstantial evidence supports our belief that the scheme is still actively under consideration."

The current economic situation may make the question an academic one. In 1981 Notley put the cost of a north-south transfer of water at $15 billion. "The potential for bankrupting the province with a scheme of this magnitude is very real," he said. The potential is even greater now, especially if the plan includes, as Eisenhauer suggests, using the diverted water to irrigate a further eight million acres. Eisenhauer's "very conservative" estimate of the total cost is a staggering $30 billion.

The controversy is worth mentioning here because it illustrates an important characteristic of river basin planning: its high political sensitivity. This has been the case since the early days of Mesopotamia and Egypt. In Alberta we need go back no further than the provincial election of 1971 when Premier Lougheed's campaign included opposition to a Socred scheme which the Conservatives claimed, justifiably or not, included new exports of water to the US.

A river basin plan brings changes, and the changes have to be socially and politically acceptable. Public funds will be used to pay for changes, and public servants who will be accountable for the financing have to make sure that they are getting the best value for the public's money. But political caution can add to an already lengthy planning process.

One important characteristic of river basin planning is its high political sensitivity. This has been the case since the early days of Mesopotamia and Egypt.

The third step in this process is the production of the strategic plan itself. Based on the analysis carried out in the first two steps, the plan should set what O'Riordan has described as environmental management targets for each resource sector that are consistent with the policies and priorities of the government. The recommended plan should consist of a combination of water-management alternatives that are economically feasible and both socially and environmentally desirable.

"The study was originally planned as a five-year program," Glenn says of the SSRBPP. "The strategic planning phase got going about mid 1980. It was to have been finished last year, but there are complications in the South Saskatchewan."

One of the complicating factors is the Master Agreement on Apportionment by which Alberta has agreed to leave about half of its South Saskatchewan flow for use by Saskatchewan and Manitoba. But the South Saskatchewan is fed by the Red Deer, the Bow and the Oldman rivers.

"And there is no policy in Alberta that says how much water in the three feeders should go to Saskatchewan or be used in Alberta," Glenn points out. "We have to know how much water in the Red Deer, for example, can be used in the Red Deer (basin). When it comes to establishing priorities for the use of water do you have one blanket policy for the whole basin or separate policies for each sub-basin?"

The strategic plan dealing with these questions was to have been completed in 1983. The remaining two years of the original five-year program were to be devoted to more specific studies of the sub-basins. Again this is consistent with modern approaches to strategic river basin planning.

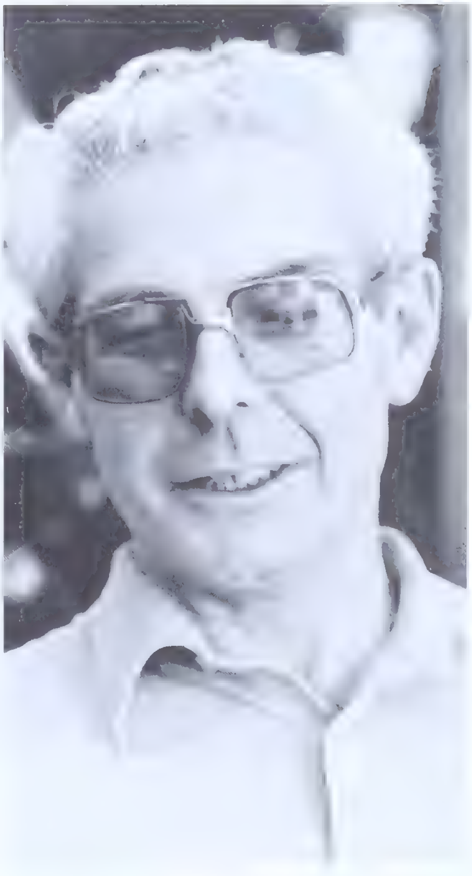
"Most contemporary approaches to resource planning are hierarchical," O'Riordan told the Banff conference. "Planning on a regional scale with long time horizons provides a context for more detailed planning for smaller units with shorter time horizons."

By spending time in the early stages developing their methodology and analytic techniques Glenn and his team hoped to speed up the later stages.

"Future progress should be faster," Glenn says, "because the planning has already been done. Furthermore, the Oldman and the Red Deer basins have been studied in the past. They just require updating. For the Bow we would need a maximum of two years."

But the planned completion dates of 1983 for the overall strategic plan and 1985 for the sub-basin specific studies have been delayed. Partly this is due to government policies on public participation.

"The Water Resources Commission has decided to hold public hearings," Glenn explains. "That might take a couple of months depending on how many hearings they hold. Then we don't know how long the commissioners will deliberate on their findings."



Jack Glenn

As Glenn and Marks have both pointed out, the emphasis in the SSRBPP has since its inception been on the future. How far into the future the implementation of their eventual plan will lie depends ultimately not on the planning process but on the political process.

Ron Duffy is a former geography lecturer and researcher who is now a Calgary freelance writer and researcher

Sharon Adams

Alberta's River Basins

An overview of the geographical and management issues

To a large extent, geography determines water resource uses and issues in Alberta's six major river basins. Uses and problems may vary from southern to northern basins, from mountainous to prairie terrain, and even along the length of any one river.

Dick Hart, southern region senior river basin planner, says the major problem in the three southern basins is "imbalance of supply and demand." There is simply more land to be irrigated than there is water to do the task. It has become a political question as to where, when and how much to add to the nearly 1.6 million sq. km now under irrigation.

A second problem shared by southern basins is water quality downstream of urban centres, primarily affected by sewage effluent. This is a particular concern in winter when low flow does not dilute effluent, exacerbating effects on downstream users, fish and fish habitat.

Recreation is also a big issue in the south. Its basins hold two highly-used national parks, Kananaskis Country and a legion of provincial parks and wilderness areas. "Anything which changes the recreational value of a river system is very sensitive," Hart says.

Finally, the three southern basins are affected by international and interprovincial water-sharing agreements. The Prairie Provinces Water Board Master Agreement on Apportionment dictates one-half of the natural flow of the basins must be passed on to Saskatchewan (although Alberta can decide what amount each basin contributes to the total). The Oldman is affected by the Boundary Waters Treaty of 1909, which divides flow from the St. Mary, an Oldman tributary, and Milk Rivers, both of which cross the international border.

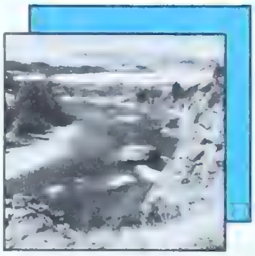
These basins will also be vitally affected by the South Saskatchewan River basin plan, which will outline "management objectives" for the overall system.

Northern region senior basin planner Bruce MacLock identifies agricultural drainage as a serious concern, especially when combined with friable northern soils, which wash away in some places.

Flooding, both during spring run-off and due to ice jamming, is also common. A stable municipal water supply is also a shared concern.

Northern planners, he says, are now working on "a co-operative approach" to managing northern basins, which do not respect provincial boundaries. There are no apportionment agreements yet, however.

The Oldman River Basin



The Oldman River rises from an alpine lake on Mt. Lyall and flows through the foothills to the plains in eastern Alberta, draining 16,157 sq. km and serving about 125,000 people.

The basin's fertile soil and long frost-free period make it ideal for agricultural development — except for an imbalance in water supply and demand. The basin supplies water to 10 of the province's 13 irrigation districts; two of its districts, the Lethbridge Northern (LNID) and St. Mary (SMID) account for nearly half of the 1.6 million sq. km irrigated in the province.

This is a "wild river," unregulated by man, to Brocket. A weir on the Peigan Indian reserve diverts water to the LNID. The Oldman's southern tributaries, the Waterton, Belly and St. Mary, are the major sources for the SMID, which is served by 11 water reservoirs of varying sizes and a 350-km irrigation canal network.

Although there are isolated local issues, such as the effect of clear cutting on upper tributary drainage and the quality of water downstream of feedlots and municipalities, most of the water issues in the basin concern irrigation.

Cattle fording The Oldman River (left)
Bow River at Banff (right)
The upper Red Deer River (far right)

Basin planner Lorand Szojka says that during a serious drought farmers in the LNID, which has little storage and limited canal capacity, "could lose up to $40 million." The LNID is awaiting a provincial decision on where and when a storage dam will be built.

The major SMID concern is upgrading and rehabilitation of its extensive canal and reservoir system, but it is also affected by U.S. irrigation. The U.S. has not always claimed its entire share of the St. Mary River flow in irrigation season; what was not claimed was used in Canada. In 1983, for the first time, the U.S. took its full share.

Issues affecting the entire basin are salinization of soil and land use planning.

Salinization occurs under two circumstances: On drylands, major groundwater movement brings dissolved salts to the surface; irrigation raises the water table, dissolving salts in the soil, which are brought to the surface during evaporation. All irrigated land salinizes to some extent, and leaky canals can exacerbate the problem (which is one reason irrigation canals are now being lined). Salinization is a factor to be considered in increasing irrigated acreage — once land has been irrigated, salinization may make it unsuitable for returning to dryland farming.

Land use decisions have a big effect on water issues. The Oldman basin has five times as much land to be irrigated as it has water for irrigation. How much land should be added to irrigated acreage, and where and when, is a political decision.

Planning has helped in reaching that decision.

In 1974 the Oldman River Flow Regulation Study called for investigation of storage on the LNID, public debate of water issues, and additional planning studies. In 1978, the Oldman River Study Management Committee recommended staged planning and development — between 1979 and 1985, LNID storage and reservoir and canal rehabilitation, and between 1985 and 2005, a LNID dam and further canal system developments.

In 1980 an Environment Conservation Authority (ECA) report disagreed about the need for a dam, and brought to light public concerns about recreation and environmental protection. A major disagreement between the committee's and the ECA's recommendations rested on the extent of additional irrigation. While the ECA favored minimum additions, others supported larger scale development.

In 1980, the environment and agriculture ministers committed $334 million for major water conveyance and storage systems, as well as a dam (site still undetermined) to serve the LNID and private users.

The Bow River Basin

The Bow River rises from glacier-fed lakes north of Lake Louise, flows east through the foothills to Calgary, then southeast to 85 km east of Lethbridge to join the Oldman to form the South Saskatchewan River. It drains an area of 25,615 sq. km, and serves a mostly urban population of 660,600.

Basin planner Jack Glenn says there is "no remarkable" conflict between the two upper basin uses — recreation and hydroelectric power generation. "Without the dams, there would be fewer opportunities for lake recreation." The basin has 11 hydroelectric plants, and the river and several tributaries are dammed for water storage.

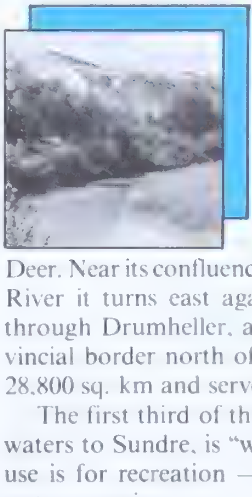
Fluctuations in water level from dams can increase or decrease fish habitat over a very short time, and the dams themselves are a barrier to migrating fish. But the dams are also beneficial. Releases keep the river open at times it might naturally freeze to the bottom, and higher flows during the winter dilute sewage effluent and aerate the water. However, dams designed to store water for power plants cannot prevent flooding, a problem upstream and in Calgary.

Water is needed in Calgary for domestic, industrial and municipal uses. The city returns 80 per cent of what it draws as sewage effluent, which causes "95 per cent" of the basin's water quality problems. Nutrients in the effluent cause algae and weed growth, infringing on the international trout fishery downstream. In addition, says Glenn, "as far as Carseland, the river should not be used for contact recreation."

Irrigation is the major use below Calgary, claiming 95 per cent of the basin's consumption. A weir on the Bow supplies the Western irrigation district; water is diverted near Carseland to the Bow River district; and the Eastern district is supplied by a diversion at the Bassano Dam.

Work on a basin plan will begin after the South Saskatchewan basin plan is finished, but there have been a number of studies on specific problems in the basin, such as flooding or water quality degradation below Calgary.

The Red Deer River Basin

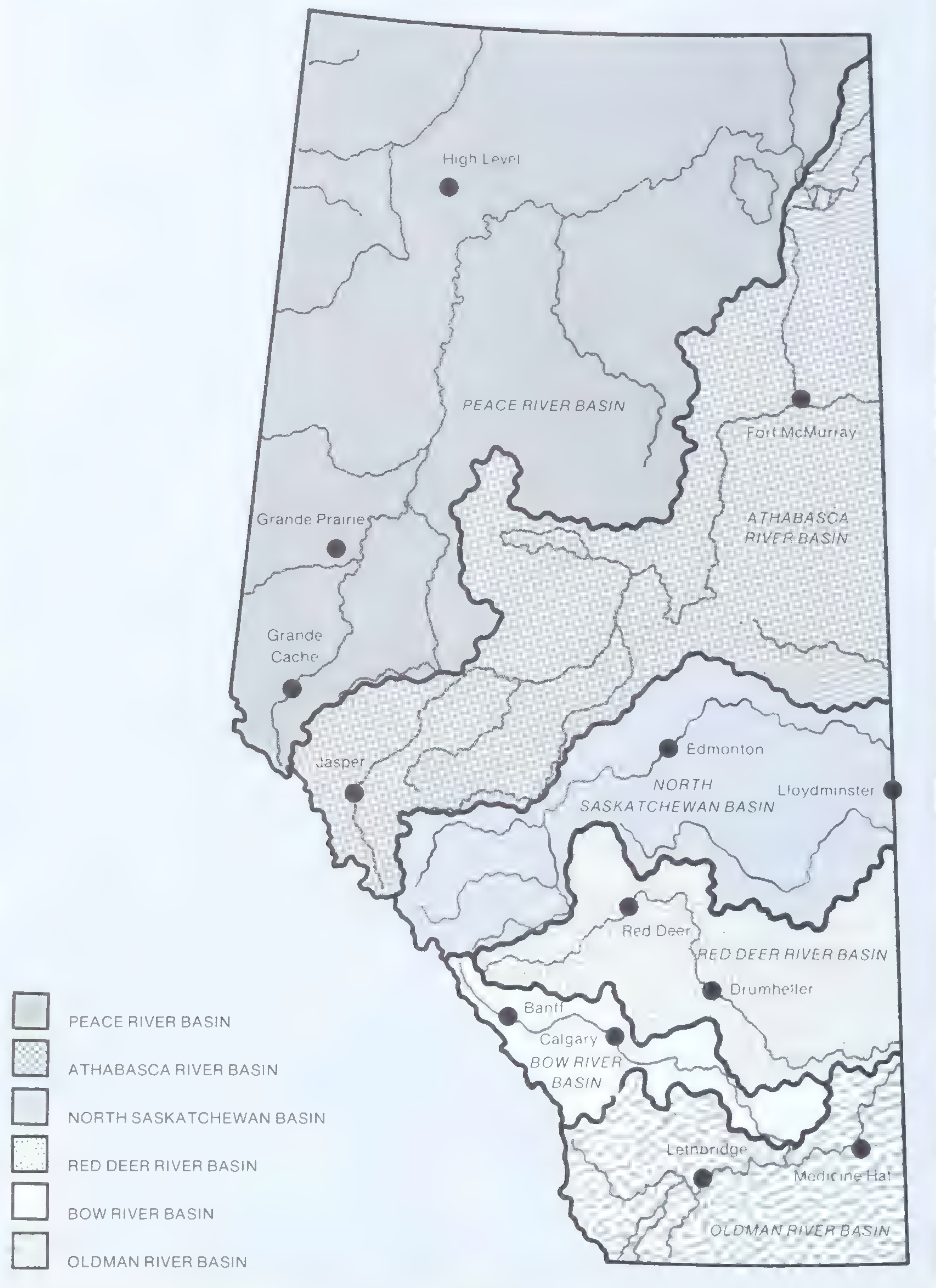


The Red Deer River rises in the Bear Range of the eastern Rockies, flows east through the foothills, then swings northeast through parkland to Red Deer. Near its confluence with the Blindman River it turns east again, veers southeast through Drumheller, and crosses the provincial border north of Empress. It drains 28,800 sq. km and serves 130,000 people.

The first third of the basin, from headwaters to Sundre, is "wild," and the major use is for recreation — fishing and white water canoeing.

Water use in the middle third, from Sundre to Drumheller, is balanced among municipalities, industry and agriculture, with some recreation. It is here that measures can

THE RIVER BASINS OF ALBERTA



be taken to ensure water quality and supply downstream.

The Dickson Dam, upstream from Red Deer, was built to overcome seasonable variability in flow, and winter's low oxygen levels and concentrated sewage effluent below Red Deer.

The major industrial use in the basin is petrochemical plants, which use river water for cooling and processing.

About 33 per cent of the basin's population draws water directly from the river or its tributaries; another 43 per cent is supplied by private wells and dugouts. The Mountain View Regional Water line supplies mid-stem communities which are too far away to draw river water and cannot locate, or have found poor quality, groundwater.

Little of the Red Deer flow is used for agriculture (due to natural soil salinity), so it contributes, on average, 90 per cent of its flow to fulfill the provincial apportionment agreement, making up for the smaller contributions from Oldman basin.

The lower third of the basin, including some arid Special Areas, faces water shortage. Users here store water and face rationing regularly.

River basin planner John Wuite reports many "problem-solving" studies have been completed or are underway, including the Buffalo and Pine Lake stabilization studies and the Special Areas Water Management Study. The largest has been the 1975 Red Deer River Flow Regulation Study, which resulted in construction of the Dickson Dam and the community water supply pipeline, study of the Drumheller flood plain, and pipeline supply to the Sheerness and Deadfish thermal power plants southeast of Hanna.

The North Saskatchewan River Basin

This river basin drains approximately 100,000 sq. km between its headwaters in Banff-Jasper National Park and Prince Albert, where it joins the South Saskatchewan to form the Saskatchewan River.

Mountains and foothills supply about 95 per cent of the basin, and though there is some industrial development in the upper reaches (forestry, mining and oil and gas development), overall it uses little of the flow and creates little downstream effect.

Above Edmonton the basin's major use is power generation. There are two hydro dams and six thermal power plants on the upper basin. Hydro plants alter natural flow downstream. While this can contribute to isolated flooding, dam releases in winter aerate the water and dilute effluent. Thermal plants, which use water primarily for cooling, can cause thermal pollution which at worst can "poach" fish. Also, because part of the water drawn is lost to evaporation, return water can have a higher salt concentration.

Major uses in the Edmonton area are municipal, domestic and industrial. Downstream pollution can almost all be traced to the city's sewage effluent. Turbidity (suspended silt) is a problem during spring run-off, but the major effect of this pollution is bad-tasting drinking water.

Basin planner Dave Barton says there's a

North Saskatchewan River near Edmonton (left)

The Athabasca River near Fort McMurray (below)

"chronic" surface drainage problem in land off the mainstream in the prairie's lower basin.

The Battle River, the major sub-basin, does not meet the North Saskatchewan in Alberta, but 15,000 sq. km of its drainage basin is located in the province. It is the one area of the North Saskatchewan basin in which supply is a problem and industrial and agricultural development is limited by water supply.

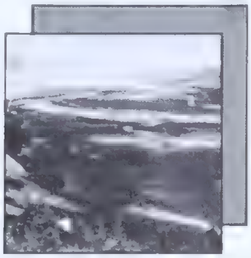
Between 1977 and 1981 Battle sub-basin problems were identified as seasonal and annual variability in flow. A 1983 proposal to build a $46 million dam was rejected, and instead it was recommended Battle River flows be augmented from the North Saskatchewan River.

There have been six studies of the one to one-and-a-half metre fluctuation in central Alberta lakes, but is was determined little could be done to ameliorate this problem, caused by natural precipitation and evaporation.

TransAlta Utilities abandoned its proposal to increase flow from the Brazeau and Big Horn dams because a company study showed it could cause destabilization of ice cover, causing flooding on agricultural land near Rocky Mountain House. Flood studies have also been done on the Vermilion and Sturgeon sub-basins.

Though it will be at least three years before an overall basin plan is undertaken, Barton says the basin has now been divided into 12 segments for water demand and flow studies, capitalizing on new technology in water balance modelling.

The Athabasca River Basin



The Athabasca River rises in the Columbia ice fields and crosses three geographic zones — the Cordillera, Interior Plains and Canadian Shield — in its 12,800-km trip to Lake Athabasca. Along the way it drains 155,000 sq. km., 147,000 of which is in Alberta. About 120,000 people depend on the river and its seven major sub-basins, for water.

After leaving Jasper National Park, it begins its northeasterly journey, passing through the Hinton region. At Whitecourt, it is joined by the McLeod and Pembina Rivers. It flows south to the town of Athabasca, then north to Ft. McMurray, where it is joined by the Clearwater River. Its journey ends at the Peace-Athabasca delta on Lake Athabasca.

Users in the upper basin, from the headwater to Ft. McMurray, include the forestry, oil and gas, pulp and paper and coal industries. There is also agriculture and recreation.

Erosion, flooding and pollution are the major problems in the basin. By the time the river reaches Ft. McMurray, it carries an average of 14 million tonnes of sediment each year, and industry upstream contributes to the problem. Basin planner Ron Hicks says "forestry and oil and gas development have opened up the area. Roads and stream crossings have increased erosion, debris in channels and flood peaks."

Effluents from upper basin coal mining and pulp mills affect downstream water quality, but the problem is ameliorated by the large flow, which dilutes concentrations.

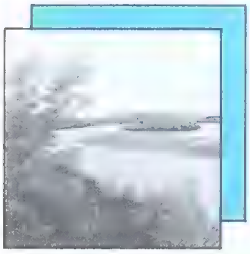
Agriculture is the major industry along the Pembina and Paddle Rivers, where agricultural flooding is a problem. Dikes have been built on the Pembina and a dam now being built on the Paddle is expected to help.

In the Ft. McMurray region, oil sands extraction plants are the major users, drawing water for cooling and processing. Spills from holding ponds and stack emissions which carry acid rain to the sensitive Canadian Shield downwind, are environmental concerns. This basin also supports fisheries. Migration can be affected by sedimentation, and spawning grounds are damaged (by egg suffocation).

Planning has been directed to specific problems, with extensive water use and management studies done on oil sands developments by the Alberta Oil Sands Environmental Research Program and environmental impact assessments done for each project.

Work on a basin plan is expected to be undertaken in the next three years.

The Peace River Basin



The Peace river basin drains an area of 295,000 sq. km in B.C. and Alberta in its 1,200-km trek to Lake Claire. In B.C. its primary use is hydro-electric power generation, for which the Bennett Dam and its massive storage reservoir, Williston Lake were built in 1968.

The river flows through the foothills east into Alberta and the city of Peace River, where it is joined by the Smoky River. It swings north to Ft. Vermilion before its eastward flow to the Peace-Athabasca Delta, Lake Athabasca and Lake Claire.

The Peace basin has the greatest amount of water of any Alberta basin, but two-thirds of it originates in B.C. and can be affected by B.C. political decisions. For instance, during the four years Williston Lake was being filled, water supply to Alberta was cut drastically with near-catastrophic results for the Peace-Athabasca Delta.

The major economic activity in the Alberta basin is agriculture with growing forestry, oil, gas and coal developments.

The Smoky River is a major tributary, serving Grande Prairie. A pulp mill on its tributary, the Wapiti River, is the Alberta basin's major industrial user, accounting for three-quarters of the industrial water consumption in the basin. Pulp mill wastes are the basin's major water quality concern.

Oil and gas exploration has caused erosion problems from road, ditch and bridge construction. Erosion and the consequent water quality problems are major issues. Erosion control was the subject of public ECA hearings in 1976, which resulted in cost sharing of erosion control works with local authorities, and creation of an interdepartmental committee to co-ordinate erosion prevention and control.

About $3 million is spent annually by Alberta Environment on drainage projects. Because of the drop from agricultural land to the river, friable soil is prone to erosion, leading to increased sedimentation in streams. This affects water quality and fish habitat.

In 1972, an inter-governmental study on effects of the Bennett Dam on the Peace-Athabasca Delta reported dam construction and operation interfered with the natural flooding of the delta's wetland habitat. Without the cyclical flooding, the delta begins to dry out and wetlands habitat for wildlife is replaced by grasslands. The report resulted in construction of weirs on the Peace River and formation of the Peace-Athabasca Implementation Committee, whose job it is to monitor the delta.

There is no interprovincial agreement on management or apportionment of flows in northern water basins.

Basin planner Nico van der Giessen says on-going studies include surface and groundwater supplies to municipalities (about 20 have already been examined), detailed evaluation of flooding, draining and erosion in two improvement districts, and assistance to local councils developing land use and water use policies. In 1982 an overview of basin use and problems was prepared, but the total basin plan is beginning to be assembled now.

Sharon Adams is a Calgary journalism instructor and freelance writer.

The Proctor and Gamble Pulp Mill on the Wapiti, is the Peace River basin's largest source of water pollution

ALBERTA GOVERNMENT PHOTO

Bernie Goedhart

Irrigation

The largest consumptive use of water in Alberta

Talk about Alberta irrigation with the experts and, as an uninitiated layperson, you'll probably marvel at the paradoxes.

Take, for openers, the fact that while farmers in the Peace River country of northern Alberta battle the problem of drainage, ridding their lands of unwanted pools of water with a minimum of soil erosion, their counterparts in the south struggle to bring water *to* their lands.

Or how about the news that, in at least one irrigation district, just at the time when their crops most need water, farmers can expect to have the supply shut down for a week or so?

Ironic, to be sure, but it's no laughing matter for the people who strive to turn Alberta's semi-arid southern region into the crop-producing land it is.

A 1982 Alberta Environment publication on agricultural water uses in the province notes that Alberta has had irrigated agriculture since 1879, when a farmer diverted water from Fish Creek, south of Calgary, to irrigate about 15 acres (6 hectares) of land.

Railroad companies provided the impetus to irrigation development in the late 1800s, seeking to improve the land they had been granted as subsidies for building the railroads. Land development companies also constructed capital works, and in the early 1900s some irrigation projects were set up by the farmers themselves. But the Depression led most of those projects to seek government help.

Today, there are 13 irrigation districts operating under the Irrigation Act and all are located within river basins contributing to the South Saskatchewan River. Most of the irrigation is done within the Oldman River basin.

Each irrigation district elects a board of directors which establishes an annual water rate — approved by the Irrigation Council that administers the Irrigation Act — and this rate, charged to the farmer, covers the district's maintenance and operating costs.

Each irrigation district is an autonomous body and the water rates vary. Currently, the highest rate is that of Lethbridge Northern, where the farmer is charged $12.50 per acre (the irrigation business is not completely metric yet) to have the district deliver water to his farm. At St. Mary River the rate is $12/acre, while Taber's is $11/acre and Bow River has a rate of $9/acre. The lowest fee is $3 an acre at Ross Creek, the smallest irrigation district.

Rates vary according to several factors, including district size and the type and cost of its equipment. At Lethbridge Northern, rates are high "because of the sophistication of the works," says Jay Purnell, head of the project planning branch, resource planning division of Alberta Agriculture, in Lethbridge. Lethbridge Northern also has an "assessed acreage" of about 118,000 acres, compared with 1,800 acres at Ross Creek.

So much for the brief historical introduction. Now things get a bit more complicated in this discussion of irrigation.

In arid regions like the desert land of California or of Israel, irrigation is carried out on a large scale because irrigation is the only means to an end — that end being crop production.

Plants need water and if nature doesn't provide that water, then man will have to if he wants plants to grow.

But southern Alberta is a semi-arid region. Things *do* grow with just what nature provides in the way of water. Dryland farms exist side-by-side with irrigated farms.

It's difficult to get exact figures when you're talking irrigation. People will tell you that too little attention has been paid in the past to data gathering. But most estimate the irrigated land of southern Alberta to be between 1.1 million acres and 1.2 million acres.

Surface irrigation systems of the border and contour-ditch type were the earliest to be used. Some of these systems remain in use today and, as is to be expected, need considerable overhaul. Again, it depends on

Irrigation Efficiency

Irrigation ditch south of Lethbridge

ALBERTA ENVIRONMENT PHOTO

"Irrigation efficiency" is one of those glib phrases that seems straightforward enough until you ask someone what it really means.

And it depends on who you ask.

To begin with, it's almost impossible to get an easy-to-understand definition of the phrase. The definition varies from person to person depending on whether the expert you're consulting approaches irrigation from the point where water is diverted from the river, the point at which it passes through canals on its way to the farm, the point at which it is applied on-farm via such things as sprinklers, or the point at which it is finally used by the crop.

Not to mention that a considerable amount gets lost in the process — whether by spillage, seepage, or the natural cycle involving evaporation or transpiration – and that much of this loss returns itself to the system eventually and therefore isn't really lost.

Add to all that the fact that data collecting has, up to now, not been a major priority in the area of irrigation.

The result is anything but straightforward.

"Irrigation is the diversion, conveyance and spreading of water on land for the production of agricultural crops," says R.T. Heywood, irrigation water management specialist with Alberta Agriculture in Lethbridge. "That's a very simple definition, but that's really what we're trying to do with irrigation."

"We want to do it without wasting . . . and to make a profit at it."

To irrigate efficiently, "you have to apply the right amount of water at more or less the right time," says Heywood, and that entails irrigation scheduling.

Different crops require different amounts of water. Alfalfa, for example, can yield four to five tonnes per acre with a water use of 610 to 660 millimetres. Soft wheat can yield 90 to 100 bushels per acre with a water use of 460-510 millimetres. Sugar beets, another specialty crop that can be grown with irrigation, can yield 18 to 22 tonnes per acre with a water use of 510-560 millimetres.

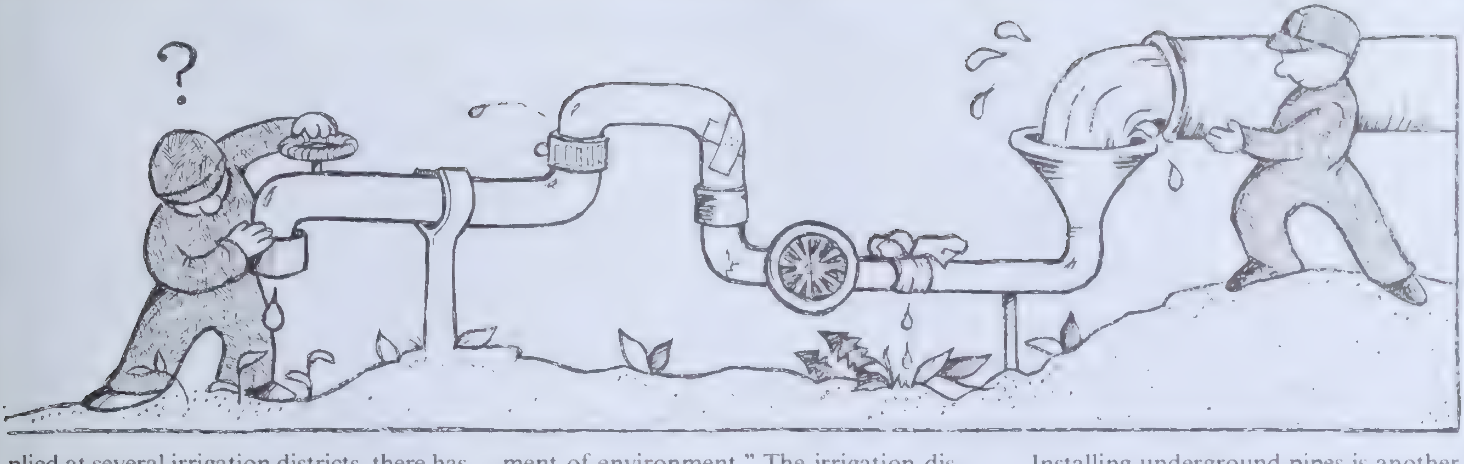
The water comes from natural precipitation, the storage of natural precipitation in other than the growing season (e.g. as snowpack), and irrigation. "The only one of the three that we can control is irrigation," says Heywood.

The department of environment diverts and manages the water, the irrigation district delivers or distributes it, and the farmer ultimately applies it to the land. Each sector contributes to the efficiency, or lack thereof, of the irrigation procedure.

A number frequently thrown out in discussing irrigation efficiency is that of 40-percent efficiency — i.e. 40 per cent of the water diverted for irrigation use ultimately reaches the farm. The rest is lost through seepage, spillage and evapotranspiration.

But it's one of those figures that can be misleading. Some of that lost water will turn up downstream. Some of the water that disappears via evaporation, for example, is eventually returned to the river through the natural cycle.

Nevertheless, there is a significant enough loss in the delivery system to warrant changes aimed at making the system more efficient. While expansion moratoriums have been ap-



plied at several irrigation districts, there has been considerable attention paid lately to rehabilitation of existing irrigation facilities.

Ron Francis, who retired early this year as acting director of Alberta Agriculture's irrigation division in Lethbridge, says the rehabilitation program, which has included such things as lining canals with concrete to prevent seepage, began in 1969-70, when the provincial government allocated $750,000 to the project.

SUSAN BRUN

R.T. Heywood

"In 1971, that was increased to $1 million and in 1972 to $2 million annually. In 1975, Heritage Funding got into the picture, with $90 million allotted to districts for rehabilitation over a 10-year period and $110 million to the department of environment for headworks, on-stream storage, etc."

About one-tenth of that amount was spent annually for five years, says Francis, but in 1980 funds were reallocated "on the basis of $100 million to irrigation for a five-year period and $134 million to the department of environment." The irrigation districts have since been granted an inflation factor, says Francis.

He says no decision has yet been made on funding when the project ends next year, but several studies are being done to determine the import of irrigation.

Lethbridge Northern, one of the irrigation districts which has a moratorium on expansion, has about 1,045 kilometres of canal and in 1968 began rehabilitation in the form of lining canals with concrete and some with polyethylene.

"Four years ago, we concrete-lined a mile and a half of canals," says Frederick Ross, general manager of Lethbridge Northern. "It used to be that we would put 13 cubic feet per second in the top end in order to get two cubic feet per second out.

"That was one of our worst canals.

"Now that it's concrete-lined, you put two in at the top end and you get about two out."

Ross says not all the canals are in that situation; some go through sandy land, where they lose a lot of water, while some go through tighter soil where seepage is not that urgent.

At Lethbridge Northern, some of the canals and ditches were originally constructed about 1921, with water running through as of 1923. "We're still using them," says Ross.

Surface irrigation systems were the earliest to be used in Alberta and, with irrigation in this province having its origins in the late 1800s, it's not surprising some of the canals are showing signs of age. Weeds grow in them, seepage occurs, and evapotranspiration takes its toll as well.

Jack Ganesh, section head of evaluation and management in Alberta Agriculture's project planning branch at Lethbridge, says the rehabilitation program "is improving efficiency all the time."

Salinization is another problem inherent in irrigation, with water leaching salt from the soil and bringing it to the surface. "With rehabilitation, you bring those lands back into production," says Ganesh.

Installing underground pipes is another way to cut down on water lost by seepage or evapotranspiration. But installing these pipes is an expensive proposition, and land has to have a steep enough grade to make the system work. An advantage of underground pipes is that the land is available for use.

Over the years, there has been an on-farm move towards sprinkler irrigation as opposed to open-channel irrigation. By the same token, recent years have seen a swing towards the centre pivot sprinkler system as opposed to the hand-held or even wheel-roll and volume-gun systems.

Jack Ganesh

It doesn't necessarily mean that centre pivot is the most efficient, says A.E. Pungor, branch head of farm irrigation services at Alberta Agriculture in Lethbridge.

There are about 1.2 million acres (484,800 hectares) of irrigated land in Alberta and "I would say that about 60 per cent of that is done by overhead irrigation — a sprinkler that works with gravity," says Pungor.

continued from page 19

"Out of that, the split is again 60/40 with about 60 per cent centre pivot and 40 per cent wheel rools, volume gun and so on."

A centre pivot unit can be visualized as similar to a mathematical compass.

Pungor says a centre pivot is usually located at the centre of a quarter section. He describes it as "a long arm on wheels that rotates in a circle." It involves continuous movement, but has the disadvantage of not reaching corners in a rectangular section of land. Designed to clear corn rows, it allows "a very tall man to easily walk under it without banging his head."

A wheel-roll, says Pungor, is basically "a quarter-mile-long pipeline that serves as an axle on wheels."

"This one sits for a number of hours and then has to be moved, manually usually every eight hours."

Sprinkler systems can cost the farmer between $80,000 to $120,000 and many farmers have a system on each quarter section. Total expenditure on irrigation equipment can easily be in the $300 to $350 per acre range.

Efficiency of these systems "depends on the management capability of the farmer," says Pungor, adding that it is possible to get full efficiency from any method — including gravity distribution systems, or ditches, etc.

"You can have a Cadillac or a Volkswagen," Pungor says "Which one is more efficient? It depends on how you drive it."

He notes, however, that in the last two years "application efficiency has improved tremendously."

"We feel farmers are more conscious of how to best use water.

"The money situation is somewhat tight. It's forcing people to tighten belts and use things better . . ."

If, as Heywood says, irrigation is basically the application of water to land with the aim of producing agricultural crops — without waste, and for a profit — then it seems ironic that 100-per-cent efficiency is not necessarily the end goal for each farmer.

"The idea is that you don't have a straight-line response, but a curved line," says Heywood. For example "if you put an inch of water on you get 10 bushels, but if you put another inch of water on you get nine (more)", and so on. At some point it becomes economically unfeasible to continue adding water, when the farmer considers energy expended, labor, etc. and puts them alongside the increasingly-smaller gains.

Ross, at Lethbridge Northern, also uses the curved-line response to illustrate his claim that farmers do not have a tendency to over-irrigate. If anything, says Ross, they under-irrigate.

— *Bernie Goedhart*

Centre pivot system near Fort McLeod (page 21

Jay Purnell

who you talk to, but a figure often quoted is that 60 per cent of the water sent to the farm gets lost before it reaches that land. Seepage through old canals or overly-porous ground, spillage and the natural cycle of evapotranspiration all take their toll.

It's difficult to say just how much canal is currently in use, because no one has really measured it accurately. Estimates place it around about 10,140 kilometres.

Sprinkler systems have made great gains as a method of irrigation over the years, so that of the estimated 1.2 million acres irrigated in Alberta today, about 60 per cent is done by means of overhead sprinklers. That number, in turn, breaks down to about 60 per cent by centre pivot sprinkler and 40 per cent by wheel rolls, volume gun, and the like.

Such equipment is costly for the farmer. Add the annual water rate he is charged by the district, plus the cost of energy to run his equipment, and you begin to see that irrigation farming is not a cheap operation.

The water itself, interestingly enough, is provided to the irrigation districts relatively free of charge. This is a bone of contention for those who feel that water, in this day of conservation, should be paid for if it is not to be wasted.

Irrigation, after all, constitutes the largest *consumptive* use of water in the province. There are those who feel its use should be metered and measured at the farm gate.

And while there's no doubt that irrigation improves crop production, some may question whether it's worth it in the grand scheme of things. Most of Canada's irrigated land is in Alberta, but in the world context it probably accounts for less than half of one per cent of all irrigated land.

And figures from 1978 illustrate what niche irrigated crops occupy in the overall picture. About 744,000 acres irrigated accounted for about 3.38 per cent of the total provincial acreage. The irrigated crops that year carried a total value of $149 million, or

SUSAN BRUN

8.29 per cent of the total value of crops produced in the province.

The bottom line is that irrigation is a fact of life in southern Alberta and even its critics do not suggest abandoning it as a means of crop production. When you see the dramatic difference irrigation can make to a piece of semi-arid land, it's hard not to be enthusiastic.

Ron Francis, recently retired as acting director of the irrigation division of Alberta Argiculture in Lethbridge, says that where a dryland farm can produce about 15 bushels of wheat per acre, irrigation can enable that land to yield as much as 100 bushels per acre.

Irrigation also enables a farmer to grow such specialty crops as sugar beets, potatoes and vegetables.

Where a dryland farm can produce about 15 bushels of wheat per acre, irrigation can enable that land to yield as much as 100 bushels per acre.

Having grown up on an irrigated farm in Taber and having worked in irrigation development since university graduation, Francis allows that his comments are bound to be "somewhat biased."

"Where would the city of Lethbridge be today without the irrigation picture?" he asks. "Where would the city of Calgary be?

"There's very little industry in Lethbridge that is not related somehow to agriculture. . ."

Primary benefits such as improved crop yield are important, says Francis, but so are secondary benefits such as population growth and economic growth for the area.

Lud Prudek, who farms 400 acres (162 hectares) near Bow Island, grows sugar beets, dry beans and soft wheat. He sees irrigation as a "stabilizing instrument — so that you're not at the mercy of nature."

Futhermore, it's a stabilizing influence for the dryland farmer as well. In time of drought, for example, irrigated land can provide a source of feed for the dryland farm.

Hilton Pharis, a dryland cattle farmer in the Pincher Creek area, agrees. "The irrigation farmer complements the dryland farmer," he says.

Still, to succeed as an irrigation farmer there must be a reliable source of water. In some cases, that's not as simple as it sounds.

The irrigation season generally runs from May 1 to the end of September. During that period, it doesn't matter too much to the irrigation farmer whether there's a heavy rainfall or two because by irrigating he is assured of "a reasonably-secure amount of water — except in our district," says Frederick Ross, general manager of the Lethbridge Northern irrigation district.

"When he *really* needs the water, I can guarantee we will shut down," he adds with some chagrin.

"Last year we shut the water off July 11 and turned it back on the 18th. September 16 we shut it off and turned it back on Sept. 26."

The problem is that Lethbridge Northern is very dependent on the water flow in the Oldman River. The district has one central reservoir which holds 40,000 acre feet of water — "water that would cover an acre one foot deep" — but the current assessed acreage for the district is 118,000 acres of which 108,000 is being irrigated. The district draws some water out of the Oldman River but "at a certain point there's not enough to draw on and maintain the level of the reservoir," says Ross. "It usually occurs about the middle of June."

The first shutdown was in 1977, the second in 1979 and in 1980 "we scraped through" without shutting down. The third shutdown was last year and Ross is not optimistic about this year, with its low snowpack. "I'm chewing my elbows now," he says.

"Mind you, if it rains all summer I have no worries."

Despite such drawbacks, irrigation allows a farmer to "plan and organize his system so much better than the drylander can."

"An irrigated farmer, unless he gets hailed on, will get a crop."

It's not without financial investment, however. "The farmer will pay us $12.50 an acre for water delivered to his farm," says Ross. "He will pay an additional $35 an acre for energy required to apply that water to his crop.

"Then there's the cost of his original equipment, and depreciation . . . An individual farmer's investment for capital equipment can be $200 to $500 an acre." The latter would pay for the highly automated centre pivot sprinkler system; the former constitutes "a bare-bones system and a lot of labor."

A fairly typical assessment of land value for the Lethbridge Northern district is "$5 to $15 an acre before irrigation and $30 to $40 an acre after irrigation," he says.

Irrigation is a matter of applying the

Irrigation is a matter of applying the right amount of water at the right time, but things are rarely as clear-cut as they seem.

right amount of water at the right time, but things are rarely as clear-cut as they seem. Assuming the equipment is functioning as well as it can, there are still such questions as determining the right amount of water to apply and coping with such matters as salinization.

Water contains salts; evaporation causes salts to eventually accumulate in the soil and salts also leach from water passing through irrigation canals. To offset such things, irrigation farmers may occasionally "flush the root zone" — applying more moisture than normal to drive the salts down past the root horizon.

"But it costs money to put that much water on," says Ross. "Every time they irrigate, it costs $6 for three inches of moisture per acre.

"Farmers, being naturally economical people, do not over-irrigate."

While flushing the land with "too much" water now and then may force salts below the root zone, putting more water on the land than a crop can absorb could result in raising the water table. With natural salts present in the soil and more applied in watering, the obvious result is another salinity problem.

Arleigh Laycock, director of the water resources centre at the University of Alberta, says salinization is due in part to over-irrigating and that flushing the root zone is ineffective if the land doesn't have good drainage.

Dr. Laycock is one of those who feels it's time to put a proper value on the water. "Provincial government policy is to provide cheap water," says the geography professor.

But if the farmer "has almost-free water, he's going to waste it."

Fred Ross

"There isn't much incentive for the farmer not to be wasteful if he's not paying much for the water."

Dr. Laycock, who indicated metering water at the farm gate is a reasonable solution, says that "irrigation can't make it on its own; it needs subsidy."

"The question is how much."

Pharis, the dryland farmer who also serves as reeve for the municipal district of Pincher Creek, was a member of the 1978 Oldman River management committee and has been involved over the years in the study of water management.

He is in favor of metering and charging per unit of water at the farm gate. But he says there is "a lot of resistance" from irrigation farmers about the idea of paying for the water as it is used. (The annual rate they are currently charged by the irrigation district is not affected by how much water they use. If they do not irrigate for part of the season, they still pay the full rate.)

"We as agricultural people . . . are reluctant to put a dollar value on water.

"We're obsessed with this going-broke syndrome, even though many of us likely won't."

Pharis noted that "it is certainly going to be quite a lot of work, surveying and metering," but indicated the cost should not be too prohibitive.

"When we did the 1978 study, we found the cost would be well under $1,000 per farm."

Travis Manning, professor emeritus at the University of Alberta's department of rural economy, suggests that "until the irrigation farmer pays a fair share of the cost (of water), the public is not going to want to subsidize expansion (of irrigation development)."

Government and those in the irrigation field should concentrate on finding answers to some basic questions. "How much irrigation is feasible?" asks Dr. Manning. "Who should bear the cost of irrigation development? And how should water be priced?"

A moratorium on expansion is already in effect in the Bow River irrigation district, in Lethbridge Northern, part of St. Mary and part of the Eastern district.

Meanwhile, emphasis is being put on rehabilitation of existing irrigation systems.

And to answer some of those questions posed by Dr. Manning, moves are being made to collect that elusive data. "We don't need more studies," says Jim Barlishen, senior economist with Alberta Environment's planning division. "We need data."

Purnell, the Alberta Agriculture official in Lethbridge, says his office is embarking on a data-collecting effort this spring in the Welling block of the Raymond irrigation district. That area was chosen because it was deemed representative of most of the land: "it has both good and bad kinds of soil."

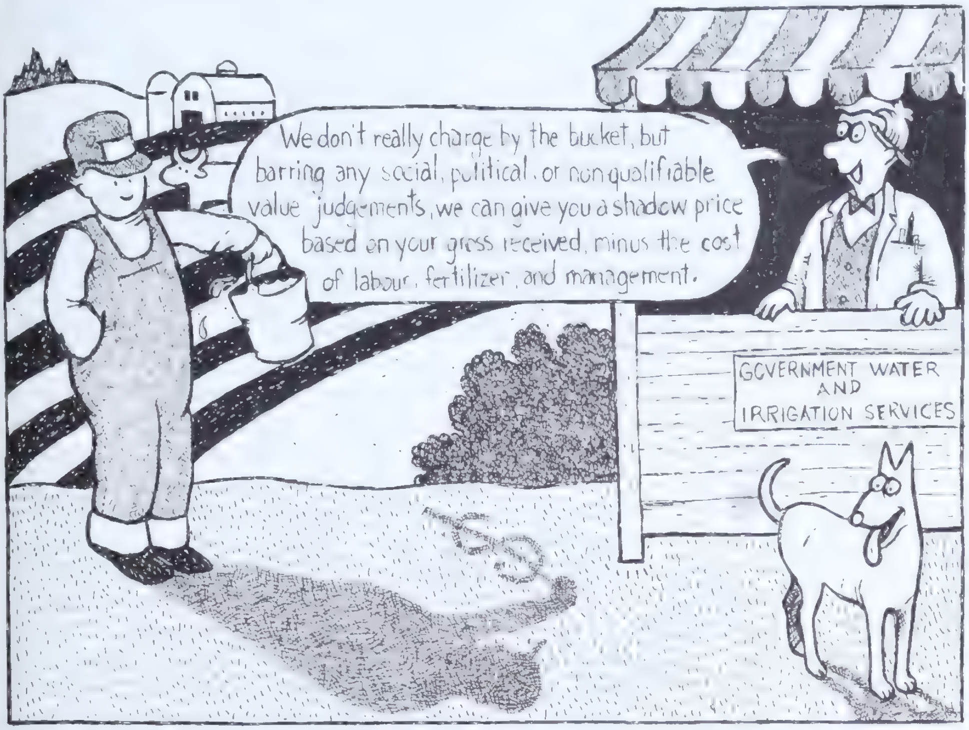
"We're going to measure the water flowing through, how much water is diverted into (the block), how much is delivered, how much is used, how much is lost by the deep percolation, transpiration, that kind of thing."

Bernie Goedhart is a freelance book reviewer and writer in Edmonton.

Jim Wilson

The Economics of Water Management

Calculating the value and cost of water resources


We don't really charge by the bucket, but barring any social, political, or nonqualifiable value judgements, we can give you a shadow price based on your gross received, minus the cost of labour, fertilizer, and management.
GOVERNMENT WATER AND IRRIGATION SERVICES

Water is everywhere — in fact there are more than 1.3 billion cubic kilometres of the stuff on the earth's surface, weighing in at close to nine quadrillion tonnes.

Even better, it's a reasonably renewable resource: the water cycle tends to take the water we manage to dirty through manufacturing, agriculture and domestic uses, clean it up and return it to us as a nice, clean (well, usually clean) liquid.

Those staggering numbers might indicate there's more water than we could possibly use up. An incredibly plentiful resource, presumably inexpensive and easy to acquire.

But that's not the case. Water is not necessarily plentiful, and it's frequently not inexpensive. The earth's surface has not been dampened equally, and moving this life-giving resource from areas of plenty to areas of scarcity is a complex, expensive business.

In Alberta there are areas along rivers and in much of the northern half of the province where finding adequate sources of water is easy. But in many of the important agricultural parts of the province, particularly the southeast, water is a scarce and expensive substance. And it's here that the economics of water management become significant because water can only be moved into these new areas via canals or pipelines or other transportation means, and that can add substantially to its cost.

It's also here that the economics of water management practices becomes murky: who pays all those extra dollars? Our society tends to expect that having an adequate supply of acceptable water is a right, not a privilege. This means the question of who pays the cost of transporting water frequently becomes a political issue as much as a purely economic one: if this "liquid of life" is a right, then the government must take both the initiative and the responsibility for its provision.

Carl Primus, director of the Alberta Environment planning division, has been involved in water resource management and planning for almost 20 years, and says that while figures and evaluation procedures have changed during that period, the fundamental principle of price and cost-sharing for water resources has not.

"Who bears the cost is always at the bottom of every final evaluation," he says. "Today in general for the more or less local projects, the cost-sharing arrangement with local authorities provides for the province to pay 75 per cent of capital costs and the local jurisdiction 25 per cent. If it's more of a provincial-scale project, the province pays up to 100 per cent of the capital costs as well as the total operating and maintenance costs if it remains a provincial project."

In formal irrigation districts, cost-sharing formulas provide for 100 per cent of the cost of headworks for diversion and delivery systems, and frequently for maintenance and rehabilitation programs. There is also a continuing Alberta Agriculture program in which the province pays 86 per cent and the individual irrigation district 14 per cent of rehabilitation projects. Ordinary operating and maintenance costs are normally the responsibility of the districts.

Sometimes the province pays what appears to be an exhorbitantly high proportion of the costs. There can be circumstances where water delivery for irrigation purposes can cost more than $125 per hectare, with the farmer paying only $17 or $18 and the cost-sharing formula causing the province to pay the rest — frequently from Heritage Fund coffers. However, making the water so expensive that it would not be economically viable for the farmer to use it would make the project absurd — and at the same time would decrease the level of improvement of agricultural production in the province.

It's here that economic tools such as benefit/cost analysis and net present value become useful — at least insofar as reasonably objective financial evaluations are concerned.

"Part of the problem in this whole debate is that we don't have a dollar value for a bucket of water," says Marvin Anderson, an agricultural economics consultant who has completed numerous water resource studies in Alberta.

"The approach we generally take today is to calculate a value for the agricultural production generated because of the additional water an irrigation or other project might provide. In doing this we're looking

only for an agricultural input for a larger evaluation program involved in any project – we're not trying to determine a positive or negative value for recreational or social or other environmental values."

In this way a "shadow price" for the water is determined: the last dollar you could get out of the potential users of new water resources if you wanted to get a 100 per cent tax return from its production.

To calculate this value, Anderson says, one establishes the gross revenue that would be generated for all farmers using the new water, and subtracts all other additional expenses involved, such as more labor, more fertilizer, more management. The resulting net income increase is the shadow price of the new water.

"In doing this we normally restrict ourselves to the values we can get a good handle on and can quantify," says Anderson. "We don't really analyze matters that could be called political — that area is for others. I'd say about 30 per cent of any project evaluation is economic considerations that we can handle, and the other 70 per cent is social, non-quantifiable value judgments."

Still, he says, this process provides an imputed price for the new water produced by any particular project proposal that's under study. But since this does not take into account any "public good" aspects of the project, "there's still a problem in establishing the real market value of the water because there are numerous other values such as regional water balance that are difficult to quantify."

Another evaluative procedure that can help in the case of proposed irrigation projects is the determination of the extent to which farmers who would be affected by the project could sustain its costs while still maintaining a viable farming operation.

Bob Morrison, a water resources planner with Alberta Environment, says two criteria have recently been established to assist in this sort of evaluation. The planners establish the level of minimum return that a farmer or group of farmers must receive from their land to cover basic operating and other costs which they cannot afford to put off without forcing themselves further into debt; and they establish the break-even return income level, at which the farmers involved would recover all costs.

"These are set up for a farmer with a 50 per cent debt/assets ratio," Morrison says. "That farmer is a pretty rare individual — a ratio of 10 per cent debt to 90 per cent equity is closer to the average. By doing this, we're trying to protect the less-experienced, younger, highly-leveraged farmers in our calculations."

The average ratio would allow approximately a 6 per cent return on the farmer's investment, Morrison said.

"We compared this information with information on historical water use, and it came out to be extremely close to where our calculations would have put the farmer each year, so we feel it's very representative of what the farmers are already doing."

These performance criteria are then used to determine other factors, such as whether the farmers at the most serious end of the debt/assets ratio could survive one year of extreme water shortages if, for instance, the project was cancelled or curtailed.

The approach has been favorably received, Morrison says, and is being tried for the first time in the South Saskatchewan River Basin evaluation program now under way.

In a general way, this approach will assist planners in evaluating whether a project is feasible as designed — whether a dam or reservoir being built for a projected 25 per cent shortfall in water for example — was the best answer; or whether in the driest years anticipated, building to accommodate only a 10 per cent shortfall might in fact be adequate.

Even this tool, however, doesn't provide all the answers, Morrison says: "The missing variable is the behavior of the farmer. What does he do when he's short of water? How good is his management ability and how does he change his procedures from a wet year to a dry year? We have the feeling that there's a certain amount of flexibility, and that farmers know how to utilize water more efficiently in a dry period.

"But we can't make that sort of study ourselves — it would take a sociologist to do an adequate job there, and probably a fairly lengthy study."

"The missing variable is the behavior of the farmer. What does he do when he's short of water? How good is his management ability and how does he change his procedures from a wet year to a dry year? We have the feeling that there's a certain amount of flexibility, and that farmers know how to utilize water more efficiently in a dry period.

Many planners have traditionally used benefit/cost analysis as a key evaluative tool for assessing the viability of a proposed water resource project because in effect it lays out in reasonably objective fashion all the economic considerations related to the

SUSAN BRAMM

What value can be placed on recreation uses in making cost/benefit analyses of river basin development?

project. However the usefulness of this technique, as with most others, is to some extent dependent on the purposes and location of the project involved.

"In any water resource project there's always a primary stimulus that results in a study being undertaken about it," says Jim Barlishen, an Alberta Environment planning division senior economist. "The project might involve drainage reduction, flood control, increased water for municipal or industrial or agricultural use. And the determination of benefits of any project are primarily focussed on the particular stimulus — flood control or municipal water or whatever — that the project bears upon."

In planning or evaluating the project proposal he says, it is necessary to envisage what benefits are going to result from it, what the cost of those benefits will be, to whom the benefits will flow, and at what cost to the beneficiaries.

Even this approach must be subdivided into direct benefits and secondary benefits. For example, direct benefits in an irrigation project might include increased productivity for the farmer and direct additional income, but to capture that new income he will also have to accommodate increased investment to use the additional water available and increased labor and other operating costs. Secondary benefits of the project might include more agricultural products for the processing industry, more jobs and other spinoffs to the general economy. But again, these would involve their own additional expenditures.

"All of these factors must be taken together to show the repayment capacity of the particular project," Barlishen says. "In general, the secondary aspects are more important in terms of overall repayment prospects, and the direct aspects are more important in terms of overall justification of the project."

The major problem economists and planners must cope with in making these calculations is that so much of the data involved is based on probabilities, not measurable quantities. "The volume of water available changes every year, for instance," Barlishen says. "It depends on rainfall and all sorts of other factors. Of course, our problems here pale in comparison with countries that have monsoons; their planning procedures are much less exact than ours.

"We also have a lot of trouble quantifying impacts on such things as fisheries and wildlife resources, where much of the scientific information we need is so uncertain — how much water does it take to make fisheries viable?

"There are also assumptions that have to be made concerning how fast the benefits will be achieved — how fast farmers will be in picking up the newly available water once the new system is in place. If they're reluctant for any reason at all — price or convenience or absolutely anything — then the project won't be viable.

"There's also a five to 10 year time between the decision and construction," he says. "and that means there's no great degree of accuracy in terms of forecasts as to crop prices, water supplies and demands and capital construction costs. All we have is our best professional judgments and experience."

Barlishen says there are other evaluative tools used to determine the economic practicality of proposed water resource projects, particularly including the concept of net present value — the accumulated worth in current dollars of all future benefits and costs of the proposed project. Benefit cost ratios are most often used in assessing the more general viability of the project, and net present value calculations, whereas net present value data would be used in selecting the appropriate size of the project.

In any event, he says, once the reasonably measurable considerations have been studied and evaluated, an enormous variety of other impacts must be considered.

"If there are any unique characteristics that would be affected by change of a water regime — and there usually are — they would also be listed, ranked and studied. Sometimes we'll get brave and say a user day in recreational considerations would be worth a specific sum of money, but one of the problems is we are never really sure what happens overall. If we build one thing and destroy another in doing so, is there a loss of recreation or simply a transfer of its location? If fishermen lose a river due to a diversion project, do they actually lose an opportunity for fishing, or do they just move to another river?"

In the South Saskatchewan program and other evaluations, Bob Morrison says these more subjective matters are receiving close attention. "We should probably distinguish here between the words 'subjective' and 'qualitative', because our judgments are based on as even-handed an approach as possible considering the impact of a project on the quality of what's being affected," Morrison says.

Qualitative changes, he notes, can be positive, negative or even neutral — the simple existence of a diversion or other water resource project does not have to imply that harmful impacts will result. "We're concerned about water requirements for recreation — minimum flow required for boating for instance. We're studying fish management impacts and requirements. We're looking at the impacts of different kinds of irrigation canals on wildlife — are concrete or earth-lined canals less likely to affect the wildlife in the area they cross?

"We're also considering the reverse impact of changing our irrigation systems. If we remove a canal where our previous actions have created a wildlife habitat, what will happen when we take it away?

"Particularly on a program the size of the South Saskatchewan, we're also taking a preliminary look at the social impacts of any irrigation project, to see whether we should go farther into this area in the future to identify positive or negative influences on the people in the area," Morrison says.

Size, of course, can have an enormous bearing on the economics of a water resources project. If it's small, such as a minor diversion intended to provide additional water for a small area, other impacts are likely to be only minimal and their cost either not measurable or at least not significant. But on major projects everything becomes important.

One of the largest conceptual water resource projects is inter-basin water transfer, in which water is moved from one of the major river basins in Alberta to another major basin — as has been proposed in the Cold Lake-Beaver River water management plan. From time to time similar schemes have been proposed to move water from northern Alberta into the southern basins for domestic, industrial and irrigation purposes.

There are numerous political considerations in these sorts of proposals. For instance, is it better to open the northern frontiers by funding drainage and flood control programs, or to enhance the southern economy by increasing its water resource management efficiency? And where, except for the Heritage Fund, could such enormous sums of capital investment money come from?

Arleigh Laycock, a geography professor at the University of Alberta, says such enormous water movement project proposals are not really unique, but they're always expensive. An inter-basin project in West Texas and Eastern New Mexico in the early 1970s for instance was shown to have costs outweighing benefits by about four to one.

"They're getting more expensive all the time," Laycock says. "And water delivery subsidies are increasing all the time as well – the province is now paying up to 90 per cent of the cost of delivering water to farmers. An interbasin scheme would increase that subsidy to almost 100 per cent of the cost.

One of Laycock's concerns, however, is only indirectly related to this consideration: in the United States, he notes, many large non-agricultural corporations are buying enormous numbers of farms, utilizing heavily-subsidized water resources for agricultural production and profiting heavily from this subsidized resource. "I can see the same thing happening in Alberta," he says. "It could easily happen that large corporations move into our farms here as well."

Still, when the "common good" of the province as a whole is considered, it's tempting to think about the proposal to move enormous quantities of water from the Peace River in the north to one or more rivers in the south. The smallest such mega-move would transport the water to the Red Deer River, adding somewhat to that basin's supply but perhaps more usefully, indirectly permitting more use of water resources in the Bow and Oldman systems. Interprovincial agreements require that 50 per cent of the water flowing from Alberta be allowed to flow into Saskatchewan. But by beefing up the amount in the Red Deer so that 80 per cent of its supply crossed the border, it would become legal to draw more from the other southern rivers on a sort of trade-off basis.

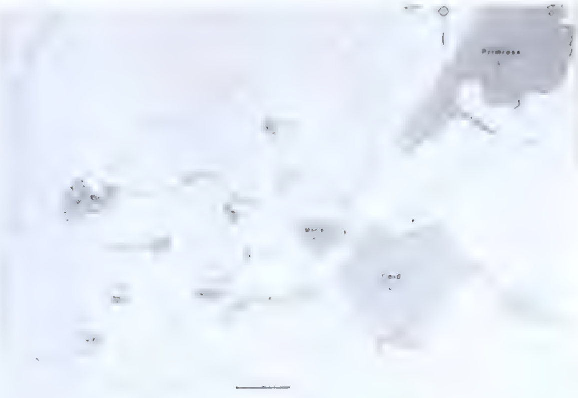
The economic problem is to be certain that the eventual benefits of such proposals are in keeping with the financial, environmental and social costs which might result.

Jim Wilson, marketing co-ordinator for the Calgary engineering firm of Reid Crowther and Partners Ltd., is a freelance writer

Norma Ramage

Meeting Conflicts

"Those of us who live in the country,
we like clean beaches and clean water.
There'll never be any lying down by any of us."



COLD LAKE STUDY AREA

Air. Soil. Water.

These three elements make up our environment, our world, our lives. So it is understandable that their use and misuse, their management or mismanagement, provokes strong and elemental feelings.

Directly or indirectly, Alberta's rivers and the basins they drain, provide most of our water. There are six major river basins: the Oldman, Bow, Red Deer, North Saskatchewan, Athabasca and Peace. Managing this vital resource is the job of the provincial government. It must take into account conflicting uses — industrial, recreational, agricultural and municipal — and try to reach a compromise acceptable to all users. It isn't an easy task and it often leads to conflict.

These are the kinds of compromises Alberta Environment is trying to reach now as it carries out water management studies on the province's major river basins. It means walking a delicate tightrope for management officials and tempers run high as interest groups support various water uses. But sometimes the conflicts can be avoided or at least ameliorated by advance planning and public participation. A good case study for this kind of technique is Alberta Environment's Cold Lake — Beaver River Water Management Study carried out over the last three years.

In some ways, the study isn't typical because the Beaver River basin, which lies in northeast Alberta near the Saskatchewan border, isn't one of the province's major river basins. In addition, the immediacy of the water user conflicts meant the study had to be conducted very quickly. But it does provide an interesting example of how a variety of groups make conflicting demands on available water supplies and of one way in which these demands can be handled.

Water management first became a problem in the area in the late 1970s when Esso Resources Ltd. announced plans for a heavy oil recovery mega-project in the Cold Lake area. In situ heavy oil recovery techniques use steam to thin the oil and a second injection of steam to force the thinned oil to the surface.

This kind of recovery can use from three to six barrels of water for each barrel of oil recovered. Local citizens became concerned about this extensive water use, explains Don Appleby, manager of the Citizens' Advisory Committee, a group that grew up at the time to keep open communications among the public, government and industry.

"A lot of people felt strongly they didn't want the lake (Cold Lake) to become nothing more than a bucket for every oil operator in the area," says Appleby.

"We had the real fear that if one company put a pipe in, then the next would say 'You gave it to them, then give it to us, too.'"

Eventually, world-wide recession and downturn in demands for oil led to the shelving of the mega project and its replace-

"A lot of people felt strongly they didn't want the lake (Cold Lake) to become nothing more than a bucket for every oil operator in the area," says Appleby.

ment by several smaller heavy oil recovery schemes.

However, Alberta Environment realized that oil recovery would always form a significant part of the area's economy and it decided to undertake a full-scale study of available water supplies and their management, explains Ron Hicks, of the department's planning division.

"There might have been enough water available for the mega project. The point was nobody knew. We just had no data about the area.

"So we took the basin study approach and decided to look at all the needs, present and future."

Hicks, who was the chief project engineer for the Beaver River study, explains that users fell into several groups. First, the oil companies who needed large amounts of water for their recovery programs. Then there were farmers, fishermen and trappers who were afraid industrial users would either take water they needed or destroy natural habitats. Municipalities and individual home owners were concerned about drinking water quality and finally, many citizens were concerned industrial use would spoil the area for what many considered its prime uses, tourism and recreation.

Cold Lake and the small lakes that surround it make up the Lakeland recreational area, one of the province's major tourist areas and one that is expected to grow substantially during the next few years.

"We had to look at whether water withdrawals would harm fish and wildlife habitats," says Hicks, "and at whether we could preserve beaches in front of cottages and beaches at campgrounds."

It was anticipated that rationalizing all the conflicting user needs would "be a long process with much gnashing of teeth and debate," says Hicks, so from the beginning Alberta Environment opted for a strong public participation element in the study.

Bill Diepeveen of the department's community affairs branch says his aim was to involve the public from day one.

"Public involvement had to mean something. If it was seen as meaning nothing, seen that we were just coming in and telling them what we were going to do, that their input meant nothing, then there would be an uproar," says Diepeveen.

Diepeveen's job was complicated by the fact that there was already an informed, educated, active group of concerned citizens in the Cold Lake area. The public had become heavily involved in ERCB hearings on the proposed mega-project in 1978 and by the time the Beaver River Basin Study was initiated in January, 1981, groups like the Citizens' Advisory Committe had been active for some years.

"This made it a greater challenge," says Diepeveen. "I not only had to appear to provide public input, we actually would have to or these people would know it.

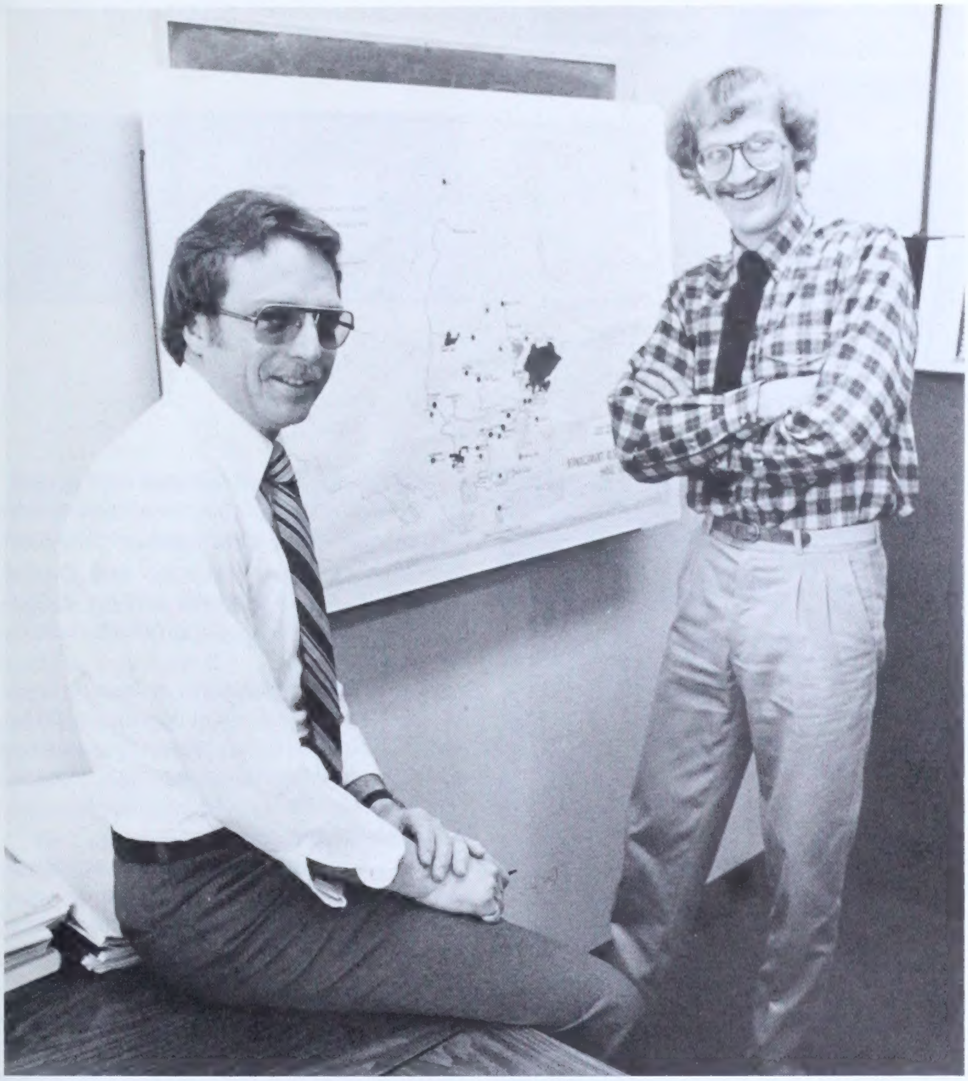
"But it was also an advantage because these people were very knowledgeable and they knew how to take advantage of and make full use of all the opportunities you gave them."

When the public participation program was initially announced, however, many residents were skeptical, recalls Appleby.

"We were a little cynical. People figured this would be a study to justify withdrawing the water, a deal between the government and Esso Resources. So people just sat back and said 'Now let's watch them justify it.'"

But Appleby's opinion, and the opinion of most area residents changed as the public participation program got underway, to the point where Appleby now says, "There's a lot of criticism of Alberta Environment and on other issues I'm one of those critics. But on this study, I give them a lot of good credit marks."

Diepeveen started by making sure he and other Alberta Environment officials kept in close touch with the Community Advisory Committee. This group, which has representative from local government, environmental groups, farmers, trappers and industry,



BILL MCKEOWN

Ron Hicks and Bill Diepeveen

was set up in 1978 as a forum for discussing issues related to water use. Diepeveen and department officials like Hicks attended the regular monthly meetings of the CAC to exchange information.

> ***Appleby now says, "There's a lot of criticism of Alberta Environment and on other issues I'm one of those critics. But on this study, I give them a lot of good credit marks."***

"It was good for us," says Diepeveen, "because it brought us into contact with a lot of people and gave us a lot of information."

Diepeveen also sent out regular newsletters and held a number of public meetings around the district. Meetings were also scheduled with special interest groups such as cottagers, municipal government and local Indian bands to provide them with information and to hear their concerns and criticisms.

"We gave everybody access to all the information we had, all our technical data," says Diepeveen.

The result of all this, he feels, was that the Water Management Study officials got valuable information and suggestions which they were able to incorporate into the final management plans and the local people ended up with a "fairly positive" attitude toward Alberta Environment and, more importantly, toward the water management proposals.

"The fact we went out and showed we were serious about listening to them and serious about using what they told us, made it easier for them to accept our findings," says Diepeveen.

Appleby agrees. "When you're asked to sit down at the table and take your best shots, to be critical, to make recommendations and when you see those recommendations considered and made a part of the plan, what can you say?"

For example, says Appleby, several of the recommendations made by local people were incorporated into Esso's water withdrawal licence. "And we asked for a well to be dug to 5,000 feet instead of 1,500 and we got that."

Robert Strayer, an Ethel Lake farmer, puts it simply: "They really took our concerns to heart, 100 per cent."

The study officials were also successful in resolving another type of conflict — between government departments.

Says Hicks: "When we started the study, people in Fish and Wildlife thought we'd go in looking strictly at getting industrial use. Their original attitude seemed to be 'don't touch anything'".

The difficulty, says Hicks, turned out to be one of philosophical background and training.

"Ask an engineer for a cost estimate and he'll crank out a number to within two decimal points whereas a biologist, by the nature of his job, can't be exact. Once we realized these basic differences, we could talk and straighten things out."

A second conflict, with Energy and Natural Resource's integrated land management plan for the Lakeland area, was more complex.

"Our plan for Lakeland focusses on water recreation," explains Andy Bowcott, planning co-ordinator for the Lakeland Integrated Resource Plan.

The result was that ENR planned a wilderness recreation area for the same region of the Sand River recommended by Alberta Environment as the site of a reservoir.

And there were other conflicts. "A water pumping station or a weir on a lake doesn't fit in with our wilderness concepts."

Although each department was aware the other was working on a plan for the area, says Bowcott, the conflict didn't become evident until December, 1982 when the plan was put before the integrated resource planning committee.

"What happened was we didn't have proper co-ordination back and forth. Although we had representative in the other department, we weren't active participants in each other's plans up to that time," Bowcott explains.

After December, however, a member of

Baroque Lake (left) and an aerial view of the Beaver River (below).

DAVID TREW

Alberta Environment became a full member of ENR's Lakeland planning committee and Bowcott regularly attended Alberta Environment management team meetings.

And they found compromises. For example, Alberta Environment has agreed to investigate putting the dam on the Sand River north of an area ENR would like to see used for wilderness canoe trips.

"It's not perfect," says Bowcott. "When you come out of the Wolf River into the Sand River, there's a dam right there. But this way, a canoeist can go down the Sand River. Before, he couldn't."

In other areas, such as Wolf Lake, Environment and ENR are discussing ways of building dams and pumping stations so they "don't significantly intrude or interfere with the wilderness character of the area," says Bowcott.

The long-term results of this inter-governmental dispute are likely to be positive, feels Bowcott.

"This experience has forced us to deal with this issue of co-operation, allowed us to move to a better understanding. This conflict was only solved by a co-operative approach and hopefully we're closer to an integrated resource management approach to planning."

The final result of this co-operation between government and the public and between government departments, is the Cold Lake — Beaver River Water Management Study outlining both short-term and long-term water management plans for the area.

Although the final document has not yet been released, says Hicks, it doesn't differ substantially from the various outlines published over the last few years. Basically, these are short-term management plan to take water from the Beaver River and eight area lakes. Five other area lakes, considered to be highly susceptible to damage by water withdrawal, will be used only for fish, wildlife and recreation.

The short-term plan also calls for constant monitoring to make sure withdrawals aren't causing damage.

DAVID BESPALKO

Three long-term water management plans have also been suggested: continuing to use local lakes and the Beaver River; building a reservoir on the Sand River; and building a pipeline to bring in water from the North Saskatchewan River.

While most local residents either approve of the short-term management plan or at least accept it as the best possible alternative, many of them are concerned about its implementation, says George Kupfer, president of Fresh Start Social Consultants, a company hired by Alberta Environment to assess its public participation program.

"The program was effective as far as allowing public input into the management program. In fact, in all the years I've been doing this kind of thing, this is one of the best programs I've seen," says Kupfer, a sociologist and former professor of social planning at the University of Alberta.

"But it's still open to question as to what effect this input will have on actual changes. It's fine to have input but if there are no changes because of it, then you have to say it's been totally ineffective."

Kupfer said his discussions with people in the area showed they were concerned with the pace of implementation. "They see Esso moving ahead with vigor and they're worried if the government will get its act together in time to solve problems before they happen."

Some recommendations in the plan such as restricting withdrawals to certain lakes and in certain amount, requiring water re-use and quality monitoring have already been initiated but people like Appleby are concerned it isn't enough.

"The minister says some things are being implemented and we'll take his word," says Appleby. "But it took Esso Resources just a few weeks to get things squared away and we'd like to see government move just as fast."

Other residents like Betty Duckett, a long-time environmental activist, farmer and planning commissioners for I.D. 18, are upset that action isn't already been taken on the long-term plan, a plan which Hicks sees as coming into effect by 1990 or 1995.

If the government waits that long, says Duckett, it will find itself with a major mess to clean up.

"Right now, the lakes are very, very near the maximum short term use," says Duckett.

"The problem with many of our studies is that they're behind, we're moving too slow for the speed of industry. The long term plans should be on the drawing board right now. We can't wait. If we wait too long, we'll have to clean up a lot of mess and we will never be able to."

Robert Strayer agrees. He feels the government needs to step up its long-range plan, particularly with what he sees as a recent increase in development in the area.

"Those of us who live in the country, we like clean beaches and clean air and clean water. There'll never be any lying down by any of us. As long as we have industry and development, there'll be something for us to do."

Norma Ramage is a Calgary journalism instructor and freelance writer.

Prepared by Doug Ramsay

Using Environment Views in the Classroom

"Here we sit in Alberta with all this water and land and we're the greatest spectators in the world; we just sit and watch it . . ."

Ask a student what he/she feels is abundant and relatively free and one response is likely to be water. A few more questions by the teachers may help the student realize that water is not always abundant and certainly not free in a form that is useful to humans. Even more surprising to many students may be that water in some parts of the province is scarce and expensive.

This misconception among many students is even more important to overcome when coupled with the problem that water as a resource may become one of Alberta's most pressing issues of the late 1980s and the 1990s. Issues such as the source of water, water diversion schemes, cost of irrigation, environmental concerns and water sharing with those living outside Alberta, are not widely discussed in Alberta classrooms. However, more attention is given to water resource issues by politicians, media and environmentalists, among others, teachers will need to address these issues in the classroom. It would be advantageous therefore to introduce these issues now so that students may be able to act towards these problems rather than simply react after the fact when little can be done. Fortunately both the social studies and science curriculum can accommodate the water resource issues.

Relationship to Curriculum

Water resource management is a topic that offers a number of related social studies issues including; the rights of individuals versus the common good, whether or not Alberta's rivers could or should be diverted and what role individuals can play in water resource management.

Social Studies 10 Topic A — Human Rights in Canada

- To what extent is water resource management a responsibility of government?
- To what extent should individuals be required to conserve water?

- To what extent should the government institute a user pay policy for water use?
- To what extent is an adequate supply of water a right or a privilege?
- To what extent could or should individuals be encouraged to become involved in designing future plans for water resource management?
- To what extent can a balance be struck between the "hard" demands of water versus the demands of "soft" users?

Social Studies 10 Topic C — Canada and the World

- To what extent should Alberta (or Canada) institute a policy of water diversion to the United States?

Science

The issue of water resource management is an important one for Science students. The major curriculum areas in which this issue could be studied include:

- Science 11
- Biology 10/20/30 — student projects
- Biology 20 — environmental biology

Regardless of the course used to introduce water resource management there are two major topics for students and teachers to examine:

A. *General water resource issues*
- What is Alberta's policy on water resource management?
- What are the environmental concerns regarding water resources? How important are they to industry, agriculture and government?
- What are the problems and proposed solutions in water resource management?
- How can a balance be found among the financial, environmental and social costs of any water management project?

B. *Specific water resource issues in areas of Alberta*
- Prepare report on the condition of water resources in your area of Alberta, particularly in relationship to your local river basin system.
- Prepare a report on a study on water resources such as the Cold Lake — Beaver River study or the South Saskatchewan River Basin Planning Program.

If undelivered, return to:

Environment Views
Alberta Environment
9820 - 106 Street
Edmonton, Alberta T5K 2J6

Environment Update

Environmental Education — International Perspectives

The National Association for Environmental Education is organizing a conference on *International perspectives on environmental education: issues and actions* to be held at the Chateau Lake Louise, October 5-9.

Field trips in the area will be offered during and after the conference, which will feature speakers and discussion on global issues.

For further information contact Jim Martin, Environmental Educational Resources Branch, Alberta Environment, 427-6267.

Proceedings Available

The proceedings of last year's Society of Environmental Biologists' symposium entitled *Resource Management in the Eastern Slopes* are now available. The symposium brought together resource users in the eastern slopes of the Rocky Mountains in order to discuss ways and means of achieving multiple resource use while minimizing conflicts. Published by the society in a 98 page volume, the proceedings are available for $10.00 from: Canadian Society of Environmental Biologists, Box 12, substation 11, Edmonton, T6G 2E0.

Environmental Law Conference

The Environmental Law Centre is organizing a national conference on the *Enforcement of Environmental Law* to be held in Edmonton May 23-25. The conference will feature presentations on topics such as strict enforcement, alternative methods of enforcement, and methods of improving the system of environmental law. There will be speakers from across the country representing senior levels of government, prosecutors, defense counsel, enforcement officers and private enforcement.

For further information, contact: Environmental Law Centre, Room 411, 10201 104th St. Edmonton, T5J 1B2 (425-6740)

Solar Energy Conference

The Solar Energy Society of Canada, Inc. (SESCI) will hold its 10th annual national conference at The University of Calgary, August 2-6.

The conference will attract some 400 delegates from around the world to attend technical sessions, present papers and participate in workshops. In addition, about 2,000 people from Calgary and surrounding area are expected to attend a trade show.

For further details contact Bill White — Publicity and Promotion Coordinator for the conference at 284-7429.

Newsletter

The Environmental Law Centre has begun publishing a quarterly newsletter on environmental law issues in Alberta. Subscriptions are $10/year. Contact the centre at 411, 10201 104th St. Edmonton T5J 1B2, or 425-6740.

The Future of Water Reuse

The third international symposium on Water Reuse will be held in San Diego, California, August 26-31, 1984. This week long meeting, administered by The American Water Works Association Research Foundation, will be dedicated entirely to renovation and reuse of wastewater from all sources and the recycling of water by individuals, municipalities, industries or agriculture.

For further information contact Jon DeBoer, AWWA Research Foundation, 6666 West Quincy Ave., Denver Colorado 80235 USA (303) 794-7711.

Environment Week 1984

To mark Environment Week June 3-9, Alberta Environment and the ECA are co-sponsoring a conference entitled *Communicating Environment Trends,* to be held at Red Deer College June 1-3. Contact Jim Martin of Alberta Environment 427-6267 or Ken Nelson of the ECA 427-5792.

Activities and displays co-ordinated by the Alberta Environment Week Committee will be held throughout the province. For a complete list of events contact Amanda Keeling of Environment Canada 420-2546.

Regulated Streams

The Third International Symposium on Regulated Streams will be held in Edmonton, August 4 to 9, 1985, under the sponsorship of Alberta Environment and the University of Alberta. The major topics for discussion will be instream flow requirements, thermal resetting, nutrient spiralling downstream of reservoirs, modelling regulated streams, effects on water-sheds, interbasin transfers, behaviour in reservoirs.

For further information, contact: Hal Hamilton, Alberta Environment, Pollution Control Division, 2nd flr. Deer foot Square, 2938 11th St. N.E. Calgary T2E 7L7 297-8271

If you have a short news item of province-wide interest you'd like to contribute to Environment Update, please send it to the editor at the address on the Contents page. The editor reserves the right to select and edit the items.